LUBRICATION AND LOST WORK IN LOCOMOTIVES.

All motion between machine parts in contact, is opposed by frictional resistance. The movement of a journal in its bearing is the result of an expenditure of energy. It is only when the lubrication is bad that there is wear of the metal parts and it may be assumed in considering the general case that the energy expended in wearing away the material of the journal and its box may be wholly neglected. Accepting this view, it follows that all of the energy employed in overcoming the friction of a journal is expended in giving motion to the film of lubricant which is interposed between it and its box and that ultimately all of the energy appears in the form of heat. The process, while commonplace enough, is interesting in the relations it presents. For example, a journal resting in its bearings is set in motion. The resistance to be overcome is represented by the viscosity of the lubricant. As energy is absorbed, the temperature of the lubricant increases and gradually, heat passes outward from the lubricant to the metallic parts surrounding it until finally it is dissipated into the surrounding atmosphere. After a considerable period of running under constant conditions of load and speed, the journal and all parts in its immediate neighborhood assume a fixed condition of temperature. Those exposed surfaces which are nearest the lubricant becoming most highly heated, while more remote have lower temperatures. Under these conditions, there is a constant flow of heat from the lubricant, outward through the metallic parts of the machine and from these to the atmosphere. Moreover, the amount of heat flowing into the atmosphere is directly proportional to the work done in overcoming friction. It follows that the temperature of the metallic parts adjacent to a journal may be accepted as a direct indication of the energy which is being absorbed by the frictional resistance of the journal. The lost work increases when the temperature rises and diminishes when the temperature falls. It follows also that the metallic parts about a journal, when warmed to their work, must always have a higher temperature than the air about them.

The friction of any large machine such, for example, as a locomotive running at speed represents many horse-power, the heat equivalent of which must be radiated from its machine surfaces. A modern locomotive lubricated with oil may run for a long time in an atmosphere of 60 degrees F. without any of its bearings becoming sufficiently heated to feel warm to the touch, notwithstanding which fact they may be radiating the heat equivalent of from 50 to 75 horse-power. This condition may be accepted as evidence of low frictional losses. All this is of especial interest in view of a practice fast becoming common whereby axle-boxes and pins of locomotives are lubricated with grease instead of oil. It is admitted that greased journals run at higher temperature than those which are oiled, and this admission is equivalent to charging the greased journal with greater frictional loss. But the practice is justified because it gives the better protection against delays arising from deficient or defective lubrication. Grease lubricated locomotives not uncommonly come in, with journals so hot that they fry grease at every pore, and in such cases it is evident that their operation throughout the run has been attended by a very high frictional loss. From an operating point of view, grease appears to be a success, but from a purely academic point of view, the arguments are not all favorable to its use. In all this no wholesale condemnation of grease is intended. It is serving to keep locomotives on the road when many other things have failed, but its use is nevertheless a make-shift made necessary by conditions which the locomotive designer has not yet succeeded in overcoming by means which are more logical.

While grease appears to give great relief to those who have been troubled by flowing babbitt and scored box, it may not be the only means available. It is apparent first of all that there should be a better proportion of parts, the adoption of which would make unnecessary the present unusual means of lubrication. So long as this cannot be accomplished there yet remains the possibility of using graphite mixed in oil which, if it can be supplied the journal with regularity and certainty, will not only insure the safety of the rubbing surfaces but effect a decided reduction in friction even as compared with that obtained from oil. It is impossible to score a journal in the presence of good flake graphite. Again, there is always the possibility of substituting ball-bearings for smooth-surface ones. We understand that at least one manufacturer is prepared to apply ball-bearings both to the axles and crank-pins of locomotives, observing limitations as to the pressure imposed upon individual balls which in other service have given perfect satisfaction. But whether it is to be overcome by better designing, by the use of graphite, by the adoption of ball-bearing or what means soever, it is to be hoped that the reign of grease will be short.

THE ST. LOUIS WORLD'S FAIR.

The Transportation Building at the World's Fair contains a fine exhibit of our best engines and cars, and thus affords an opportunity to mark, by comparison with the fair of 1893, the progress that has been made in the past eleven years. The railroad man who reads railroad literature knows pretty accurately about this progress already, and to him the educational value of the exhibit at the Fair is chiefly in its effect in impressing on his mind those salient facts which he knows but does not know well enough. This is by no means a useless process, and every railroad man who can conveniently go to the Fair should go; though it is proper to say that if he were nothing more than a railroad man, and took no interest in architecture and the arts and crafts, in beauty and ingenious inventions and human progress generally, he would find a somewhat narrow lesson. Of course, it is highly important to take your boy of 16 to the Fair if you can afford the time to do so.

The Machinery Building and that devoted to electricity are, of course, of interest to mechanical officers, and some of the improvements shown in them call for more study than do the cars and engines; because, unlike cars and engines, a machine is not constantly advertising itself by traveling up and down in the land. In shop tools, as in locomotives, the progress made during the past 11 years has been in perfecting speed and power rather than in changing principles or fundamental processes, and here as well as with engines it is useful to supplement descriptions and pictures and narrow experience by visible object lessons covering wide experience. In electricity great progress has been made, but here, also, the magnitude of the industry is at least as striking as its triumphs of ingenuity and skill. The General Electric Company bewilders the observer with the number and variety of its productions; and the Westinghouse companies are so numerous as to require a big directory and two information bureaus.

In the broad field of transportation, the automobiles, of course, show the most numerous elements of novelty. Of these there is a good display of all kinds in the buildings, and there is another important exhibit outdoors; the sightseeing omnibuses (electric). These, of which there are dozens constantly traversing the grounds in all directions, are as useful and popular a feature of life at the Fair as they are with strangers in the cities of New York, Washington and Denver; though the guides' jokes are not so cunning. As the magnificent distances in the St. Louis grounds materially intensify the feeling of "lead in the shoes" that afflicts most people at all great fairs, this ideal adaptation of a force of nature for the use of man is, therefore, nothing less than a triumph. It would seem as though the 'mobile 'bus might be made to add still another important convenience by being used for regular lines, direct from one point to another, within the grounds, without making stops to see things. The Intramural railroad is too roundabout (made so for a proper purpose) to afford quick transportation in the busiest parts of the grounds, except to and from a few places.

The automobile as a freight carrier is also coming to the front, and there are examples on exhibition. The auto truck appears to be increasingly appreciated in cities, and it may be that where freight houses now keep miles of streets blocked every day with waiting teams for half an afternoon, we shall some day be able to turn the horses out to grass and see a reduction of the nuisance to half-miles.

On the ocean, as on our railroads, the most notable improvement of the past 10 years has been in bigness, and the models of steamships do not attract by any salient novelty. The turbine steamer is yet too new to be prominent. The electric launches on the lagoon seem to be duplicates of those which were seen at Chicago in 1893 and at Buffalo in 1901.

In automobiles the exhibit of utility is found in the omnibuses just mentioned, while the exhibit of variety and newest designs is to be found in the beautifully finished vehicles in the Transportation Building; but in electric cars to run on rails, the outdoor working exhibit (the Intramural railroad) is in itself a good example both of the utilitarian features and of beauty and simplicity

of design. This railroad, seven miles long, with its western terminus brought around to within a few rods of the eastern, will give to foreigners a good idea of the characteristic American "trolley road." It is on the surface nearly all the way, trestles (wooden) being used only for a short distance at one end, and to cross ravines in what may be called the unimproved portion of the park. For a short distance on the north side it is what may be called a street railroad; but practically all of the rest of the line is sufficiently fenced in to bring it within the class of private-right-of-way railroads. There are several places where may be seen the characteristic American "deadly grade crossing"; though the speed of the cars is uniformly so moderate that it is perhaps ungracious to suggest the thought of crossing-dangers. This moderation in speed is, indeed, one of the attractive features of the road, affording a refreshing relief from the strenuous conditions of city street transit. The quick starting and the high speeds on curves that prevail now in all our cities, and that have perforce made even our grandmothers agile athletes (if they ever ride in street cars) are unquestionably an evil, even though we complacently accept them as a necessary evil; and it will be nothing amiss for a few thousands of us to try "going slow" for once. Opportunity for sightseeing is, of course, one reason for moderate speed; possibly there are others.

The cars are about 20 feet long (not "open"), with transverse seats and a central longitudinal aisle, and they are run in trains of two, with a fare collector in each. The St. Louis Car Company is the builder, and they are good examples, without freaks or exaggerations. At each of the 17 stopping places there are platforms, with enclosures and gates, but the gates are not now in use, and fares (10 cents each) are collected on the cars. Thus we have as one "exhibit," for the edification of the world, the unbusinesslike but almost universal American custom of collecting fares in such a way that the conductor who does not steal is looked upon as an impossible paragon. The unpleasant feature of the Intramural railroad is the ever present cheap-grade lunch counter, every station being given up largely to baked beans, coffee cups and untidy attendants.

In all of the foregoing, as the reader will have noticed, it is an American fair that we have been considering. Foreign nations are not absent, but they do not tell us much that is new and striking. The two most prominet foreign nations are Germany and Japan. Japan has nothing which is likely to instruct Americans about transportation, and Germany chiefly, as has Japan largely, devotes her exhibits to other fields of science and industry and to art. One German exhibit, however, is prominent, and is noticed by everybody, the big Henschel three-cylinder compound locomotive, of which more will be said in a later issue. Aside from these there are a multitude of books and records and pictures, affording to the visitor with some leisure interesting studies of methods and habits in the several countries; but none possessing salient features susceptible of easy comparison with American ways of doing things.

That the advertising motives, which used to be thought sufficient warrant for sending all kinds of exhibits all over the world, has now largely died out, is not to be wondered at, for the photographer and the technical journal have become so expert and enterprising that different nations know each other and are able to see each other pretty well without actually touching hands. Indeed, Germany and Japan appear to have made their great exhibits at St. Louis not to instruct the world, or even, so much as formerly, to sell goods; but from a "human" motive—to show their friendly feeling towards America. On a gigantic scale they are copying the tactics of the merchant who is as careful to take buyers to the theater and to make dinner parties for them as to show them meritorious wares.

Some notes on the locomotives and cars will be given in another issue.

CONCRETE AND METAL TIES.

Another new design of reinforced concrete cross-tie is illustrated and described elsewhere in this issue, together with a brief statement of the result of a year's trial in the track of the Ulster & Delaware. Like nearly all the other experiments made with metal and concrete ties during the last 15 years, the first few months of service have been highly encouraging as regards resistance to exposure and low cost of maintenance. But a good sound white oak tie also gives excellent service for the first year or two in the track. Five years, even ten years, is hardly long enough to positively determine the ultimate saving by the use of some such material as steel or concrete, and also the average life of ties made of one or the other. The life of a wooden tie is about six years, and the present cost of such ties laid in the track is between 30 cents and 75 cents, rarely more than that. The cost of manufacture alone of the many designs of steel or concrete ties varies from 50 cents to $3.50 apiece, being usually more than $1.50 rather than less. By a rough calculation, allowing for decreased cost of maintenance, which is a debatable point in favor of the metal tie, it must have a life of at least ten years in order that it may stand on an even basis of cost with the wooden tie. So far as we have been able to ascertain, every experiment made in the United States with ties of other material than wood has proved to be a failure before the end of ten years, and but one or two have lasted that long. Some of the forms of ties designed three and four years ago are still in use, apparently giving hopeful and instructive results, but they cannot be classed as unqualified successes. An engineer of maintenance of way summed up the situation not long ago by saying that when oak ties cost a dollar apiece he would begin to consider the use of some substitute. In his eyes there was no real advantage in using any of the proposed metal or concrete ties other than that they might cost less in the long run than wooden ties when wooden ties had a prohibitive first cost laid upon them. Undoubtedly the time will come in this country, as it has done in some parts of Europe, when the supply of timber suitable for cross-ties will have become so limited that some other material more permanent and lasting will have to be used, even at a high first cost. The claims of European engineers about the good qualities of metal cross-ties other than their longer life have never been fully substantiated in this country, and there is little positive information even about that essential point. The use of tie-plates, spike plugs, and, above all, preserving processes, will do much to put off the day when the wooden tie can no longer be used economically, and will give so much the more time for the patient investigators to thoroughly test their new designs of some other materials. Innumerable failures must accompany the development of any entirely new departure from the old way, and it is well not to be too sanguine as to the success of the experiments in their present condition. Let us wait and see.

The meeting held in New York September 8, by the committee selected to arrange for an exhibit of railroad appliances in connection with the International Railway Congress, at Washington, next May, marked the beginning of a very interesting enterprise. The chairman, Mr. George A. Post, in his address to the committee of thirty-three representative railroad supply men whom he had gathered about him, told of the scope and functions of the Congress, and pointed out that a unique opportunity would be afforded to show the ablest and most influential railroad men of all countries what had been accomplished here in developing appliances. The difficulty in effectively presenting a new device at most expositions lies partly in the fact that only an exceedingly small proportion of the visitors are interested, while the number of prospective buyers is smaller yet, and partly in the confusing array of articles tending to distract the attention even of those most concerned. But the audience at the Railway Congress will be made up of men who are not only trained experts in the different branches of the service, but who are the authoritative heads of the buying department. These foreign railroad men, moreover, will have no Pike, with its side shows, to divert them from the appliances which are to be exhibited. The exposition will be designed for a trained audience only, and for an audience able to buy. Even to those manufacturers who are not interested in a foreign market for their goods, the appliance exhibit will be of the greatest value because it will be seen and studied by the great gathering of American railroad officers, who will come from all parts of the country to attend the Congress. A chance, better than ever before, seems to be presented to give the fullest publicity, both in this country and abroad, to the American railroad appliances that represent the result of the ingenuity and perseverance of generations. The committee considers it essential to the success of the proposed exhibition that permission be obtained to use the White Lot, in Washington, and a bill will be presented in Congress to authorize such use.

American Locomotive Company.

In 1903-1904 the American Locomotive Company enjoyed a remarkable year, for which the report is now at hand, in that with gross earnings $36,974 less than during the year ended June 30, 1903, manufacturing, maintenance and administrative expenses decreased $647,329, leaving net earnings $610,355 greater than last year. The total gross earnings amounted to $33,068,750. A smaller sum than last year was also charged against net earnings for interest on bonds of constituent companies, bills payable, etc., so that

the profit available for dividends was $5,425,539, as against $4,805,253 last year. After a 7 per cent. dividend had been paid on the preferred stock, as previously, costing $1,750,000, there remained a surplus from the year's operations of $3,675,539 as compared with $3,055,253 last year. From the current surplus $1,000,000 was appropriated as an extraordinary improvement and betterment fund, and a current balance of $2,675,539 was carried forward to profit and loss.

The company's gross earnings in addition to the revenue from the sale of new locomotives and extra parts, included the sale of steam shovels, dredging machinery, trucks for electric service, and rotary snow plows, and also repairs. The expenses included direct manufacturing cost, both of labor and of material, and all indirect charges against production, such as maintenance and renewal of buildings, machinery and tools and shop expenses and supplies, etc. Besides this, 20 per cent. depreciation was charged off, during the current year, from the book value of patterns, drawings, templets, iron flasks, formers, and dies. The item of expenses also included a charge of $1,101,299 for additions to property. The work of rearranging old shops with a view to greater economy in the manufacturing processes has been actively continued during the year, and there have also been heavy outlays for the replacement and betterment of existing property, which the company believes will make it possible, in connection with similar disbursements in previous years, for the property to be fully maintained and renewed in the near future at a small average annual cost. During the past year, the mechanical and electrical engineers of the company have kept in mind the problem of the possible future application of electric power to steam service railroads, and have also consulted with regard to the specific proposition for an electric locomotive suitable for use in the suburban traffic of the New York Central. Agreements have been entered into with the General Electric Company for the manufacture of 30 electric locomotives, to be delivered by 1906, the American Locomotive Company to construct the mechanical parts and the General Electric Company to supply all the electrical apparatus.

The report says frankly that the company does not expect to maintain during the next year or so the exceptional volume of business which it has received during the past three years, and this decrease is doubtless already being felt. It is believed that the improvements in organization and in the efficiency of plants have now progressed far enough so that the company will be in good shape to weather a period of dull business and to reduce operating expenses and cost of production when gross earnings fall off.

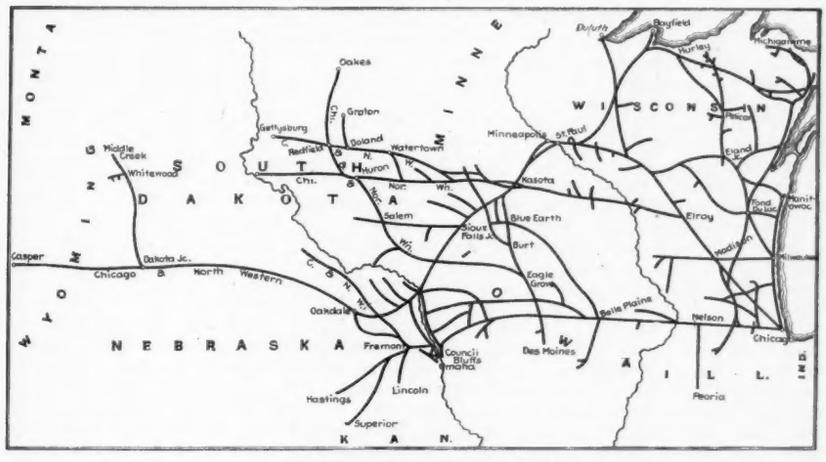
At the directors meeting held June 6, 1904, Mr. Robert J. Pitkin was elected President of the company, succeeding Mr. Callaway. Mr. James Sague was elected Vice-President and Mr. Leigh Best, Third Vice-President, while retaining his position as Secretary. Mr. William M. Barnum was at the same time made a director.

Chicago & North Western.

The fiscal year of this company has now been changed to end on June 30 instead of on May 31st, as previously, so that the reports are uniform in period of time covered with those published by the majority of railroad companies. The figures for the present year instead of being compared with the previous fiscal period are compared with the 12 months ending June 30, 1903, and a separate income account is made up for the intervening month. Gross earnings for the 12 months aggregated $53,334,633 as compared with $50,639,142 for the preceding 12 months, but as these earnings were from 7,404 miles in 1904 as compared with 6,457 in 1903 the earnings per mile of road decreased from $7,842 to $7,203. Passenger earnings increased somewhat faster than freight earnings during the year and amounted to the high total of 17.42 per cent. of the entire earnings. Like most of the roads reporting thus far, operating expenses, including taxes, increased faster than gross earnings, aggregating $37,227,109, as against $33,851,672, an increase of $3,375,437, where earnings increased but $2,695,492. A considerable part of this increase, however, is chargeable to expenditures for maintenance of way and structures, which were made on a very liberal scale during the year. The two items—renewals of ties and repairs of roadway and track—alone added over $700,000 to the expenditure in excess of that for the year ending June 30, 1903. New steel rails aggregating 53,530 tons were included in this expenditure, the greater portion of which was laid in replacement of rails of lighter weight in 446 miles of track. The maintenance of equipment charge of $5,509,734, an amount $307,227 in excess of that charged last year, included the cost of 1,675 new freight cars charged entirely to operating expenses at a cost of $1,061,484. It is therefore evident that, had it been deemed essential, operating expenses could have been considerably cut down.

The total charge for conducting transportation was $21,654,456, an increase of over $2,000,000, in which by far the greatest single item was locomotive fuel. Although the tonnage of freight carried decreased from 30,498,440 tons in 1903 to 28,128,810 tons in 1904, locomotive fuel cost nearly a million dollars more. This is in part to be accounted for by the longer average haul, which amounted to 144½ miles as against 132½ miles last year, bringing up freight ton miles to an amount approximately one-half of one per cent. greater than in the year preceding, and necessitating a freight train mileage of 18,106,231 miles as against 17,531,086 miles last year. The average revenue tons per train mile decreased accordingly from 230.6 tons to 224.6 tons. An increased cost was charged against practically all forms of service, the chief items being the wages of engineers and firemen, freight conductors and freight brakemen, which increased in the aggregate $344,517. The only important decrease in the detail statement of the cost of conducting transportation was the interline freight car service balance, which decreased $155,635, or about 39 per cent.

The company has never equaled the gross earnings per mile of line for 1902, which in that year were $8,097. In 1903 they were $7,843 and for the current year $7,203. The increase in mileage of the lines of the western lines of relatively thin traffic is undoubtedly responsible for this. The Chicago & North Western has been continually increasing its mileage and the figures of traffic density are naturally affected somewhat unfavorably by the presence of undeveloped new lines; but the average approximate earnings per mile run by freight trains this year were $2.07, which is a high record for the company. The average approximate earnings for the preceding 12 months were $2.05; for the year ending May 31, 1902, they were $2.02; in 1901, $1.98, and in 1900, $1.96. In fact, the increase in this respect has been continuous and substantially uniform for many years, except that the gains between 1895 and 1899 were more rapid. Of course this, in view of the smaller total tonnage and the longer haul indicates a higher rate, and, as a matter of fact, the rate per ton increased from $1.17 to $1.32. It is to be regretted that the report does not classify by percentages the chief commodities carried, and that it is hence impossible to say whether or not the increased rate was chiefly due to a higher grade of freight or whether it was occasioned by a flat increase.



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The amount of stock outstanding, both preferred and common, remains unchanged from the year ending May 31, 1903, at $73,073,431. The annual interest charges on the funded debt were again reduced by the exchange of new issues of bonds bearing a low rate of interest for older bonds outstanding. The amount of company's bonds in its own treasury June 30, 1904, was $4,667,000, as compared with $4,649,000 on May 31, 1903.

Principal operating expenses for the year are summarized below:

	1904.	1903.
Average mileage worked.	7,404	6,457
Revenue trainload	224.5	230.6
Gross earnings	$53,334,634	$50,639,142
Passenger earnings ...	13,027,708	12,161,997
Freight earnings	37,254,539	35,811,008
Operating expenses	35,389,304	32,015,178
Conducting transport'n.	21,654,456	19,639,435
Main. way and struc...	7,166,308	6,297,166
Main. equipment	5,509,734	5,202,507
Net earnings	16,107,525	16,787,470
Net income	*5,096,185	5,537,248
Extraordinary charges against net income..	4,000,000	5,013,419

*Includes net income for month of June, 1903.

NEW PUBLICATIONS.

Air-Brake Tests. Compiled and published by the Westinghouse Air-Brake Company, Wilmerding, Pa. 1904. Leather, 325 pages. There has been gathered together in this book the principal data of all of the most

important brake trials which have been made in this country and in Europe since the inception of power train braking. The results of many of these trials have been presented in papers and reports presented to the various engineering societies, and for the most part the subject matter in this compilation consists of reprints of the whole or liberal extracts from these papers. The tests are arranged in chronological order beginning with the famous Galton-Westinghouse experiments made in England in 1878-1879, and include, besides a full report of these, the Burlington trials, Paris & Lyons Railway tests, Westinghouse freight train trials made in 1887 which marked the beginning of the successful application of the quick-action air-brake, the Karner trials on the New York Central, the tests of the Pennsylvania at Sang Hollow, Shiproad and Absecon, and the hitherto unpublished tests made at Atison, N. J., on the Central Railroad of New Jersey. As a whole the book forms the most complete history of the air-brake and its development that has yet been published.

TRADE CATALOGUES.

St. Louis Expanded Metal Fireproofing Co., St. Louis, has prepared a two-leaf folder showing the results of tests of reinforced concrete beams made by Prof. Talbot at the University of Illinois and described in a paper read before the American Society for Testing Materials, June, 1904. On one page the results, recorded in tabular form, give the amount and kind of reinforcement, area of metal in square inches, maximum load in pounds, stress in steel in pounds per square inch and the age of the concrete, which was 60 days in all cases. The beams were all 12 in. wide, 13½ in. deep, and were tested on a 14-ft. span loaded at two points 4 ft. 6 in. apart. On the opposite page to the table the results are shown graphically. Four kinds of reinforcement were tested, one being with plain bars and the others with patent bars. One of the latter is, of course, the Johnson corrugated design. With the plain bars as unity, the efficiency of Johnson bars is given at 164 per cent., the highest obtained.

The gas department of the *Pyle-National Electric Headlight Company*, Chicago, issues a pamphlet devoted to the Commercial Acetylene Co.'s safety storage system, for which it is general agent. A description of the system is given, with figures on the cost to make and compress the gas, and also its comparative cost and lighting power. Car and station lighting are then taken up, and interior views of a number of cars on different roads, equipped with the system, are shown, also passenger stations, semaphore bridges and locomotive headlights. A large number of yachts have this system, a view of one being shown and a list of 61 others given. Automobile and carriage owners are also extensive users of the system.

The Joseph Dixon Crucible Company, Jersey City, N. J., are distributing its September issue of "Graphite." It is an extremely interesting issue inasmuch as it shows a number of illustrations of important modern structures such as: the St. Regis Hotel, New York; the Wabash Railroad terminal, Pittsburg; the new North German Lloyd terminal, Hoboken; and the framework of the Fifth Regiment Armory building in Baltimore.

The Northern Engineering Works, Detroit, Mich., are distributing its bulletin No. 17. This is issued as a supplement to its crane catalogue and illustrates several types of overhead electric trolley hoists. This firm also build a number of types of pneumatic hoists, and a complete line of overhead tracks, switches, and turn-tables.

The September list of *J. A. Fay & Egan Co.*, Cincinnati, contains 12 pages and offers the usual diversified lot of second-hand tools. They are principally wood-working machinery, with some iron-working tools included.

CONTRIBUTIONS

Good Principles of the B. L. E.

New York, Sept. 14, 1904.

To the Editor of the Railroad Gazette:

It was indeed a pleasure to read the two articles which appeared in last week's issue (the 9th) entitled, "The Difficulty of Getting Promoted," one signed G. S. M., and the other commenting on the same by the editor. Among the many sensible articles which have been published in the *Railroad Gazette* from time to time on this subject none have appealed to me as these have done. They were certainly brainy masterpieces, bold and fearless.

There is nothing "vicious" inculcated in the teachings of the principles of the Brotherhood of Locomotive Engineers. Their aim is to follow out as near as they can the motto, "Do unto others as you would that they should do unto you." Neither is there any authorized "brotherhood bully," delegated with authority to act as such. While it is true that jealous and vicious dispositioned persons are sometimes among the members of the Brotherhood, and their actions might lead one to look upon them as bullies, this is the individual, not the Brotherhood as a whole. We find such characters in all organizations. Such men as these are the obstacles in the way for promotion of intelligent men who are ambitious, striving to prove themselves worthy and capable. The Brotherhood does indeed endeavor to make a close bargain for its members in the matter of wages—a fair day's work for a fair day's pay—and to regulate so far as possible, all things being equal, the promotion of its enginemen, according to their rank in seniority in service, from one train to another. I cannot conceive what the question of seniority has to do with the promotion of an engineer from his rank to that of an official position. I can hardly believe that an operating officer, with any backbone, would tolerate the seniority argument, if in his judgment he found an engineman qualified for promotion to an official position.

J. PUFFENBERGER,
Ex-President Joint Municipal Board of the B. L. E. of Greater New York.

Handling Fast Freight on the Canadian Pacific.

The Canadian Pacific on Sept. 12 put into operation a new system of handling fast freight on its through trains between St. John, West St. John, Newport, Montreal, Toronto, Owen Sound, and Windsor; and between North Bay, Sault Ste. Marie, Fort William, Winnipeg, North Portal, Kootenay Landing and Vancouver. It is known as the "Red Card" system and has been designed to reduce telegraphing of car reports, to give prompt record of the movement of cars containing freight which is included in the general classification, and to ensure shipments going through to destination in the same train with proper connections at junction points.

All cars containing freight, excepting salt, iron and heavy material, to and from steamers lying at St. John, West St. John, Montreal and Vancouver; all cars containing perishable freight; all loaded refrigerator cars iced or heated; and all cars containing mixed lots of general merchandise whether in car load lots or less, are classified as "red card" cars and are forwarded with a red card 4¼ in. x 6½ in., printed as in Fig. 1, and properly filled out,

CANADIAN PACIFIC RAILWAY

THIS CAR CONTAINS

RED CARD FREIGHT

AND MUST NOT BE DELAYED

Carding Station _____

Initial _____

Number _____

Date Carded _____

Kind Contents _____

Destination _____

This card must be removed immediately car is unloaded at destination.

(WRITE PLAINLY IN BLUE PENCIL)

Fig. 1—Red Card.

FORM C. S. 10
4-8-04-38371

CANADIAN PACIFIC RAILWAY

Loaded at _____

Date _____

Initial _____

Number _____

Destination _____

Kind Contents _____

This card must be removed immediately car is unloaded at destination.

(WRITE PLAINLY IN BLUE PENCIL)

Fig. 2—White Card.

tacked on each side. The general list of commodities included under this classification includes, agricultural implements (new), bullion, copper and copper matte, household goods, live stock, nursery stock, seeds, settlers effects, etc., besides the commodities usually classed as merchandise. All other bulky freight, such as grain, lumber, coal and ore is shipped in cars to which white cards 4¼ in. x 6½ in., printed

as in Fig. 2 and properly filled out, are attached on each side.

Certain of the most important stations and junction points on the company's lines, 51 in all, have been designated as "red card" stations, and to each one, a symbol letter or letters has been assigned together with a series of numbers beginning with 1 and running up to from 50 to 1,000, depending upon the average number of loaded cars originating and forwarded from each point. These numbers and the station's symbol letter are used in numbering the envelopes in which the way-bills for cars loaded with "red card" freight are enclosed and forwarded. When the end of the series has been reached the envelopes are numbered beginning with 1 again and so on indefinitely. The envelope containing the way-bill for each car is made of red paper and measures 13 in. x 5¾ in. The front is printed as in Fig. 3 and the back as in Fig. 4. On the front of the envelope at the top are blanks for filling in an identification of the car and contents and instructions for routing to destination. Below these are blank spaces for inserting the number and symbol of the forwarding station and the train in which the car is to travel. Blanks are also left for recording the weight of the car and a reference to the regular way-bill. At the bottom are printed a few simple instructions for agents and conductors, and along one edge space is left for any special instructions following the car such as stopping for icing, etc. On the back there is printed a key to the symbols used for indicating the date of departure of the car and also blank spaces for entering a record of the car's movement. Each conductor, when the car is turned over to him at the forwarding point or division point, must enter in the space provided, the number of the train and train symbol, station car was taken from, and station at which car was left, date and signature.

When all of the cars containing "red card" freight which are to go forward from any station in a particular train, are ready, the agent gives the lowest symbol number to the red envelope covering the car for nearest destination, and envelopes covering cars for succeeding points beyond are given successive symbol numbers in their proper order, the car going the greatest distance having the highest number. For example, Toronto forwards "red card" freight in a train as follows: One car for Smith Falls, three cars for Ottawa, and five cars for Montreal. The envelopes for these cars would all bear the Toronto symbol letter R Y, and if the series of numbers was beginning with 1, with the number 1 would be given to the car for Smith Falls; 2, 3 and 4 would be given to the cars for Ottawa; 5, 6, 7, 8 and 9 would be given to cars for Montreal. The opening number for the next envelope for "red card" freight from Toronto, regardless of destination, would be 10.

The trains shown in the list below are known as "red card trains" and are given a symbol letter showing the date of departure from the terminal. Trains leaving on the first day of the month have the symbol A added to the train number, those leaving on the second day, the symbol B, and so on, and this symbol identifies each train all the way through to its final destination. In making all reports, trains are referred to

CANADIAN PACIFIC RAILWAY COMPANY

RED CARD FREIGHT

INITIALS................ (INITIALS) CAR NO...............
TRANSFERRED TO................CAR NO...............
AT......................DATE....................190.......
FROM..
TO..
FINAL DESTINATION ....
ROUTING.......................................R. R.
CONTENTS......................................
CONSIGNEE.....................................
FREIGHT OUT OF SS.............................
(SHOW HERE NAME OF BOAT FREIGHT TAKEN FROM)
CONSIGNOR..................WEIGH AT...................
STOP CAR AT................FOR.......................

TRAIN NO.____________SYMBOL LETTER...............
FORWARDING STATION SYMBOL LETTERS...............
" " " NUMBER...............

WEIGHT					REFERENCE TO REGULAR WAY-BILL
WEIGHED AT					DATE..........190... NO.......
GROSS.					STATION FROM...
TARE..					
NET....					

INSTRUCTIONS

IMPORTANT READ CAREFULLY

This envelope will be used exclusively for cars containing Red Card Freight.

When cars loaded with Red Card Freight are accompanied by the regular Way Bills, all of the Way Bills for the car must be enclosed in one of these envelopes.

Each of these envelopes must bear the Symbol Letter of the train, in which it was first handled. Each envelope must also bear the proper car symbol and number from forwarding station.

THE FREIGHT COVERED BY THIS RED CARD ENVELOPE MUST NOT BE DELAYED. IF CAR IS SET OUT ON ACCOUNT OF BAD ORDER OR OTHER UNAVOIDABLE CAUSE, CONDUCTOR OR YARDMASTER MUST SECURELY AFFIX HERETO A "SET OUT CAR" REPORT FROM C. S. 3; AND EVERY CARE MUST BE TAKEN BY ALL CONCERNED TO AVOID FURTHER DETENTION.

ALL MOVEMENTS MUST BE SHOWN BY CONDUCTOR ON BACK OF THIS ENVELOPE.

AGENT WILL ENTER ON BLANK LINE BELOW, ANY SPECIAL INSTRUCTIONS FOLLOWING CAR.

Fig. 3—Front of Red Envelope.

ALL TRAINS HANDLING RED CARD FREIGHT FROM RED CARD STATIONS, WILL BE GIVEN A SYMBOL ACCORDING TO DATE OF DEPARTURE AS PER KEY GIVEN BELOW.

KEY

DATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
SYMBOL	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	Y	Z	AB	DB	HB	IB	IC	OC

RECORD OF MOVEMENT

No. OF TRAIN	TRAIN SYMBOL	STATION NO. TAKEN FROM	STATION NO. LEFT AT	DATE	CONDUCTOR

CONDUCTORS MUST ENTER IN SPACE PROVIDED, NUMBER OF TRAIN AND TRAIN SYMBOL, STATION TAKEN FROM AND LEFT AT, DATE AND SIGNATURE.

INSTRUCTIONS

IF TRACK SCALE WEIGHT IS OBTAINED IN TRANSIT AND IS SHOWN HEREON, AGENT AT DESTINATION, OR AT JUNCTION, IF WAY-BILL IS MADE TO A POINT BEYOND, MUST TRANSFER THE WEIGHT TO REGULAR WAY-BILL.

AGENTS MUST POSITIVELY SEE THAT ALL CARS OF RED CARD FREIGHT ARE PROPERLY CARDED, AND THAT WAY-BILLS ARE COVERED BY RED CARD ENVELOPE.

Fig. 4—Back of Red Envelope.

CANADIAN PACIFIC RAILWAY COMPANY.

CONSIST "R. A." REPORT.	SENDING OPERATOR	RECEIVING OPERATOR	TIME FILED	TIME SENT
			______M.	______M.

A. B.

FROM STATION______________DATE______________190___

TO CAR SERVICE OFFICE,____________

Following Cars Red Card Freight Left this Station on

Train No. "D"________Train Symbol "F"________ Engine No. "G"________ Departed at "H"________M.

SYMBOL LETTER AND NUMBER	CAR Initials.	CAR No.	CONTENTS	Received from Connections or Received for Red Carding DATE	Received from Connections or Received for Red Carding TIME	SHIPPING POINT	DESTINATION.	REMARKS
J.	K.	M.	N.	Q.	R.	S.	U.	V.

This CONSIST REPORT is to be made up from information shewn on face of Red Envelope before each train handling Red Card Freight leaves the Station; and is to shew only such cars as are handled as RED CARD FREIGHT.

Agents at Red Carding stations, other than junction points with foreign lines will show in columns Q. and R. the date and time cars are received by them for Red Carding.

Operators must telegraph this Report within one hour after train leaves Station.

Fig. 5—Consist Report.

by their numbers and their date symbols.

Red Card Freight Trains.

Train No.	Between
85 and 86	Montreal and St. John.
19 and 20	Montreal and Newport.
51-55-57-50-52-56	Montreal, Toronto, London and Detroit.
115 and 116	Prescott and Sault Ste. Marie.
117 and 118	North Bay and Vancouver.
31 and 32	Medicine Hat and Kootenay Lodge.
105 and 106	North Portal, Moose Jaw and Vancouver.

If necessary to run any of these "red card" trains in two or more sections the extra sections are designated as 2nd 52 or 3rd 52 with the corresponding date symbol, the same as for the regular train. Where there is import, export, perishable or other "red card" freight to be forwarded in excess of load for the regular "red card" trains, extra trains are to be run to accommodate it, filling out with dead freight if necessary in order to make up the tonnage rating. These trains are identified as to class and are reported by the following designating symbols:

From	Kind of freight.	Designating symbol.
West St. John	Import.	MP
Montreal (west)	Import.	ML
Montreal (east)	Export.	MJ
Windsor	Provision.	PV
Owen Sound (east)	Boat Freight.	BF
Toronto to Owen Sound	Boat Freight.	BO
Fort William (west)	Boat Freight.	BF
Winnipeg (east)	Live Stock.	SK
Winnipeg (west)	Coast.	CF
Vancouver	Tea.	TA
Vancouver	Silk.	SI

For example, sufficient import freight is at West St. John on the 25th day of the month to load regular "red card" trains 86 and three extras. The regular train would be designated 86Z, the symbol Z representing the 25th day, and three extras would be designated as MPZ, MP2Z and MP3Z respectively. These extras and sections of regular trains are given the same care in quick despatching as the regular trains.

When a train of cars loaded with "red card" freight is made up and is ready to be sent out the agent or yardmaster turns over to the conductor of the train all of the envelopes containing the way-bills of the cars to be sent, but before doing so he is required to make out the "consist report" shown in Fig. 5, the entries being taken from the envelopes. This report is telegraphed in to the Superintendent of Car Service within an hour after the train leaves the station. Each item and column heading, as will be seen, has a letter symbol for convenience in telegraphing the reports. The Superintendent of Car Service is thus informed immediately of the departure of all "red card" cars, their contents, initial and number and destination.

The "set out car" report, Fig. 6, is printed on pink paper and is mucilaged on the back at the top. Whenever a car containing "red card" freight is set out of its proper train for any reason, one of these forms is made out by the conductor or yardmaster and pasted on the envelope accommpanying that car. The report, with the envelope, is left with the agent at the station where the car was set out, and the information contained thereon is telegraphed at once to the car service office. In case a car is set out at a siding where there is no agent the report

CANADIAN PACIFIC RAILWAY COMPANY

SET OUT CAR

"R.C." REPORT

CAR SERVICE OFFICE "A"_____ FROM "B"_____

SUPERINTENDENT "AA"_____ DATE "C"_____ 19

(GIVE HERE SYMBOL LETTER AND NUMBER SHOWN ON RED ENVELOPE)

CAR BEARING SYMBOL "D"_____

SET OUT AT "F"_____

BY TRAIN No. "G"_____ TRAIN SYMBOL "H"_____

TIME SET OUT "J"_____ ON ACCOUNT OF "K"

_____

_____

_____

_____ POSITION

INSTRUCTIONS—Read Carefully

IF FOR ANY CAUSE A CAR LOADED WITH RED CARD FREIGHT IS SET OUT, ONE OF THESE "SET OUT CAR" FORMS MUST BE PROPERLY FILLED OUT BY THE CONDUCTOR WHEN CAR IS SET OUT BETWEEN TERMINALS AND ATTACHED SECURELY TO THE FACE OF THE ENVELOPE CONTAINING THE WAY-BILLS FOR THIS CAR. THIS FORM MUST REMAIN WITH PROPER ENVELOPE UNTIL IT REACHES DESTINATION.

CONDUCTORS MUST LEAVE THESE "SET OUT CAR" FORMS WITH TELEGRAPH OPERATOR, WHO WILL TELEGRAPH THEM TO THE CAR SERVICE OFFICE AS DIRECTED, AND DISTRICT SUPERINTENDENT, AND THEN TURN THIS FORM ATTACHED TO ENVELOPE OVER TO PROPER PARTY.

THIS CAR MUST NOT AGAIN BE DELAYED EXCEPT ACCOUNT BAD ORDER. YARDMASTERS AND CONDUCTORS MUST SEE THAT THIS RULE IS ABSOLUTELY ENFORCED.

THE SYMBOL IS SHEWN ON FACE OF RED ENVELOPE.

YARDMASTERS WHO TAKE CARS OF RED CARD FREIGHT OUT OF TRAIN FOR ANY CAUSE, AND HOLD THEM FOR ANOTHER TRAIN, MUST ATTACH ONE OF THESE "SET OUT CAR" REPORTS PROPERLY FILLED OUT TO THE ENVELOPE FOR EACH CAR SO DELAYED AND MAKE PROPER REPORT OF IT TO CAR SERVICE OFFICE AS DIRECTED, ON FORM C. S. 4.

OPERATORS WILL USE SYMBOL LETTERS SHEWN HEREON IN TRANSMITTING REPORT

Fig. 6—Set Out Car Report.

CANADIAN PACIFIC RAILWAY COMPANY

SET OUT REPORT

"R. D." REPORT

THIS REPORT TO BE USED AT POINTS WHERE MORE THAN ONE CAR OF RED CARD FREIGHT IS SET OUT.

SENDING OPERATOR	RECEIVING OPERATOR	TIME FILED	TIME SENT
		M	M

CAR SERVICE OFFICE "A"_____ FROM "B"_____

SUPERINTENDENT "AA"_____ DATE "C"_____ 190

THE FOLLOWING CARS WITH RED CARD FREIGHT HAVE BEEN SET OUT AT THIS STATION.

SYMBOL LETTER AND NUMBER SHOWN ON RED CARD ENVELOPE		BY TRAIN			ON ACCOUNT OF
LOWEST NO.	HIGHEST NO.	NO	Symbol	TIME	(GIVE HERE EXACT CAUSE FOR EACH CAR-SET OUT)
"D"	"F"	"G"	"H"	"J"	"K"

SIGNED_____ POSITION_____

THIS FORM WILL BE USED TO REPORT SET OUT CARS CONTAINING RED CARD FREIGHT WHEN MORE THAN ONE CAR IS SET OUT. WHEN ONE CAR IS SET OUT, USE REGULAR SET OUT FORM C. S. 3. GIVE SYMBOL LETTER AND NUMBER ONLY WHEN REFERRING TO SUCH CARS ON THIS REPORT.

TRAIN SYMBOL IS SHEWN ON FACE OF RED ENVELOPE.

Fig. 7—Set Out Report.

CANADIAN PACIFIC RAILWAY COMPANY

DELAYED CARS FORWARDED

THIS FORM TO BE USED TO REPORT FORWARDING OF ANY CARS LOADED WITH RED CARD FREIGHT WHICH HAVE BEEN DELAYED FROM ANY CAUSE

SENDING OPERATOR	RECEIVING OPERATOR	TIME FILED	TIME SENT
		M.	M.

"R.F." REPORT

CAR SERVICE OFFICE "A"_____ FROM "B"_____

SUPERINTENDENT "AA"_____ DATE "C"_____ 190

THE FOLLOWING CARS LOADED WITH RED CARD FREIGHT, WHICH HAVE BEEN DELAYED AT THIS STATION WENT FORWARD THIS DATE.

TRAIN "D"_____ ENGINE "F"_____

TIME FORWARDED "G"_____ M

SIGNATURE "J"_____

POSITION "K"_____

SYMBOL LETTER AND NUMBER		SYMBOL LETTER AND NUMBER	
FROM	TO	FROM	TO
"M"	"N"	"G"	"R"

INSTRUCTIONS

THIS FORM WILL BE USED BY AGENTS AND YARD MASTERS TO REPORT THE FORWARDING OF CARS LOADED WITH RED CARD FREIGHT WHICH HAVE BEEN DELAYED AT ANY STATION ON ANY ACCOUNT OPERATORS MUST SEE THAT THIS REPORT IS WIRED WITHIN ONE HOUR AFTER CARS LEAVE. USE SYMBOLS GIVEN IN TRANSMITTING.

Fig. 8—Delayed Cars Forwarded Report.

CANADIAN PACIFIC RAILWAY COMPANY

PASSING "R. B." REPORT

SENDING OPERATOR	RECEIVING OPERATOR	TIME FILED	TIME SENT
		M	M

TO CAR SERVICE OFFICE FROM "B"_____

"A"_____ DATE "C"_____ 190

RED CARD FREIGHT CARRYING FOLLOWING SYMBOL LETTERS AND NUMBERS PASSED THIS STATION AS SHEWN BELOW

SYMBOL LETTERS AND NUMBERS		MOVEMENT					
LOWEST No.	HIGHEST No.	ARRIVED			LEFT		
		TRAIN		TIME	TRAIN		TIME
		No	SYMBOL		No	SYMBOL	
D	F	G	H	J	K	M	N

CAUSE OF DELAY "M"_____

_____

_____

_____ AGENT OR YARDMASTER

INSTRUCTIONS

THIS REPORT MUST BE MADE BY AGENTS OR YARDMASTERS AT DESIGNATED STATIONS, AND TELEGRAPHED TO CAR SERVICE OFFICES, AS DIRECTED, IMMEDIATELY AFTER CARS HAVE DEPARTED. IN MAKING UP THIS REPORT USE THE HIGHEST AND LOWEST SYMBOL NUMBERS WITH LETTERS SHEWN ON RED CARD ENVELOPE. MAKE SEPARATE ENTRIES WHEN BREAKS OCCUR IN CONSECUTIVE NUMBERS.

Fig. 9—Passing Report.

CANADIAN PACIFIC RAILWAY COMPANY

REPORT OF ARRIVAL-DESTINATION

"R. G." REPORT

SENDING OPERATOR	RECEIVING OPERATOR	TIME FILED	TIME SENT
		M.	M

TO CAR SERVICE OFFICE FROM "B"_____

"A"_____ DATE "C"_____ 19

FREIGHT WITH WAY BILLS CARRYING FOLLOWING SYMBOL LETTERS AND NUMBERS, ARRIVED THIS STATION AT TIME AND DATE GIVEN BELOW

SYMBOL LETTERS AND NUMBERS		ARRIVAL THIS STATION			
LOWEST No.	HIGHEST No.	TRAIN		TIME	DATE
		No.	SYMBOL		
"D"	"F"	"C"	"J"	"K"	"M"

_____ AGENT OR YARDMASTER

INSTRUCTIONS

AGENT OR YARDMASTER AT DESTINATION OF CARS WILL MAKE OUT THIS REPORT IMMEDIATELY ON ARRIVAL OF CARS OF RED CARD FREIGHT TRAVELLING UNDER SYMBOL LETTERS AND NUMBERS AND TELEGRAPH IT TO CAR SERVICE OFFICE AS DIRECTED. AGENTS AT JUNCTION POINTS WHERE CARS LEAVE THE COMPANY'S RAILS, WILL MAKE OUT THIS REPORT, SHEWING ARRIVAL OF ALL SUCH CARS AT THEIR STATIONS.

IN MAKING UP THIS REPORT USE THE HIGHEST AND LOWEST SYMBOL NUMBER WITH LETTERS SHEWN ON THE RED CARD FREIGHT ENVELOPE.

MAKE SEPARATE ENTRIES WHEN BREAK OCCURS IN CONSECUTIVE NUMBERS

TRAIN SYMBOL FOR TRAIN ON WHICH CAR ARRIVES IS SHEWN BY CONDUCTOR ON THE BACK OF THE RED ENVELOPE.

Fig. 10—Arrival at Destination Report.

and envelope is left with the agent at the next telegraph station beyond, and the agent there forwards the report and attends to the disposition of the car. If it is necessary to transfer the contents of a "red card" car to another car, the required information is entered on the envelope and red cards attached to the sides of the car to which the load was transferred. No change is made in the symbol letter and numbers which identify the shipment through to destination.

When more than one car is set out at a station for any cause, one of the pink slips, Fig. 6, is attached to the envelope accompanying each car and the set out report, Fig. 7, filled in and telegraphed to the Superintendent of Car Service. The pink slip attached to the envelope accompanying a car shows that it has been set out once and must not again be delayed unless on account of bad order.

The "delayed cars forwarded" report, Fig. 8, is used to report the forwarding of cars loaded with "red card" freight which have been delayed at a station for any cause. It is entirely separate from the consist report, Fig. 5, which gives information of cars originating from a station only and should not be confused with it.

The form shown in Fig. 9 is known as the "passing report" and is used to report the arrival and departure of all "red card" freight from certain specified stations and junction points along the line. These reports advise the car service office of the movement of all such freight between point of loading and destination. This information is telegraphed in immediately after the departure of trains and is a very essential part of the system.

When a car or cars arrive at their destination the agent makes out a report of arrival at destination, Fig. 10, which gives the time of arrival and identification of each car. If a car is consigned to a point on a foreign road, the agent at the connecting point makes out one of these reports, but if the car leaves the main line at a junction with one of the company's branch lines the agent reports its arrival and departure on the branch line train on the passing report, Fig. 9.

If freight entitled to "red card" classification originates at some intermediate station, that is a station not designated as a "red card" station, it is forwarded by the first train to the nearest "red card" station and the agent at that station is instructed to card it and forward it in the proper train the same as for cars originating at that "red card" station.

Local merchandise cars traveling as "red card" freight are forwarded as such to the last district terminal reached before distribution of the freight begins, and from that point are forwarded in the first local train out. For example, Montreal may load a car with "red card" local freight for points between Smith Falls and Havelock. The car would be "red carded" to Smith Falls, where it would be set out and travel in a way freight from Smith Falls to Havelock. Such cars are reported from the point where they leave the "red card" train on the passing report, Fig. 9.

While the system is apparently rather complicated, yet it is, in actual working, extremely simple and efficient. The Superintendent of Car Service has in his office at all times a complete record of the movement of all cars of high class freight and can determine at once the cause of any delays to shipments en route. Freight is handled with much less confusion and loss of time, and the claims for damages for delayed shipments of perishable goods are greatly reduced. One of the most essential features of the system is the great saving in telegraphing which on a large road is a heavy expense. The Atchison, Topeka & Santa Fe has a system very similar to the one just described, which has been in use since 1900 with very satisfactory results. The Canadian Pacific will no doubt have the same good results after the system is once in smooth working order.

We are indebted to Mr. C. W. Spencer, General Superintendent of Transportation, for the information and copies of the blank forms used.

The Roadmasters' Convention.

The twenty-second annual convention of the Roadmasters' and Maintenance of Way Association was held in the reading room of the Transportation Building at the St. Louis Exposition, September 13th and 14th. Mr. J. A. Kerwin (M., K. & T.), President of the association, called the meeting to order and delivered a brief address, after which Mr. Willard A. Smith, Chief of Transportation of the Exposition, made an address, welcoming the association to St. Louis and the fair.

The Secretary reported 22 new members elected. After disposing of one or two matters of business the discussion of the committee reports was taken up. There were six reports and individual papers and the discussion of each was brief and brought out little in addition to what the report or paper contained. Extracts from these papers will be printed as separate articles. The convention adjourned at the end of the second day. The officers for the ensuing year are: President, C. F. Blue (M. & O.); First Vice-President, J. L. Single (L. I. R. R.); Second Vice-President, C. B. Teller (C. & W. I.); Secretary and Treasurer, C. E. Jones (C., B. & Q.), re-elected; Members Executive Committee, W. A. Brandt, J. A. Lahey, C. H. Cornell and C. Buhrer. Next year's meeting will be held at Niagara Falls, September 12.

Extension of Block System.

On September 15 the telegraph block system was put in force on the Pennsylvania lines between Crestline and Chicago, 280 miles. The company began installing the apparatus for this improvement about a year ago.

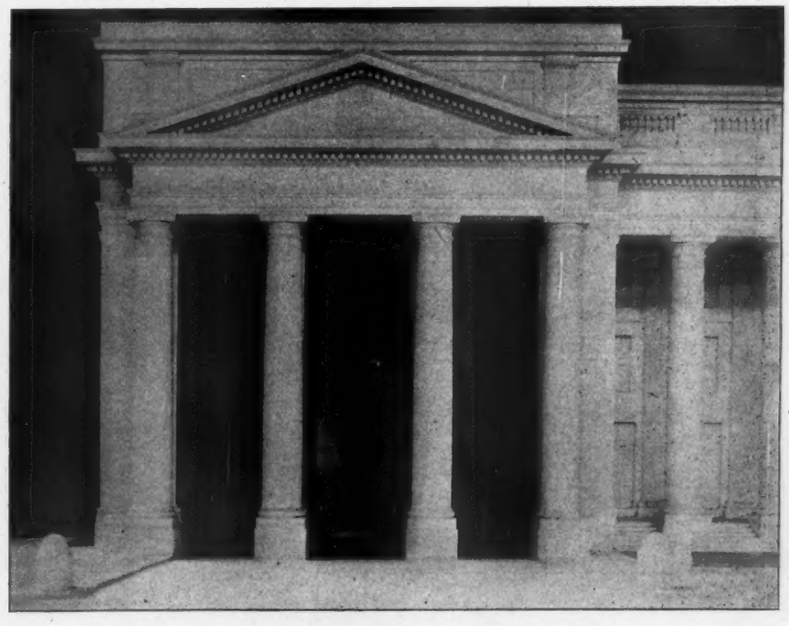
The telegraph block system is in force on the Vandalia throughout its main line from Indianapolis to East St. Louis, the system having been put in operation in May last; and it is now announced that it has been adopted on that portion of the Pittsburg, Cincinnati, Chicago & St. Louis between Columbus, Ohio, and Indianapolis, Ind., completing the establishment of the space-interval system from Jersey City to St. Louis.

New York Terminal Station of the Pennsylvania.

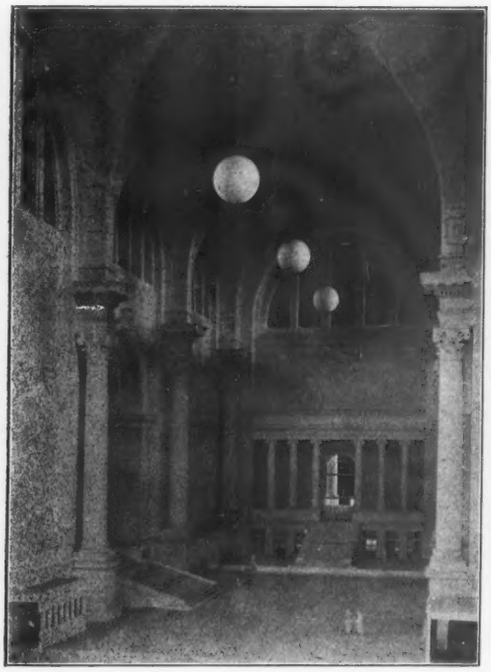
Part of the exhibit of the Pennsylvania Railroad Company in the Transportation Building at the World's Fair, St. Louis, consists of a large sectional plaster model of the new terminal station which is to be built in New York City in connection with the tremendous undertaking of driving tunnels under the North and East rivers and the Island of Manhattan. The accompanying illustrations from photographs of this model give some slight idea of the appearance of the station when it is completed. For a complete description of the tunnel work the reader is referred to the *Railroad Gazette*, Oct. 9 and 16, 1903.

The site of the new station is the ground lying between Seventh and Ninth avenues and 31st and 33rd streets. The station building above ground occupies the two blocks enclosed by Seventh and Eighth avenues and 31st and 33rd streets, but the tracks in the station will extend as far west as Ninth avenue before converging to the four-track tunnel which begins at that point. Part of the ground above will be occupied by the new Post Office building and the remainder will be occupied by dwellings and stores or possibly converted into a public park. The tracks will be about 50 ft. below the level of the street in the terminal and will be reached from the main entrance floor by numerous flights of broad stairways and elevators. There will be 21 tracks in the station, all on one level.

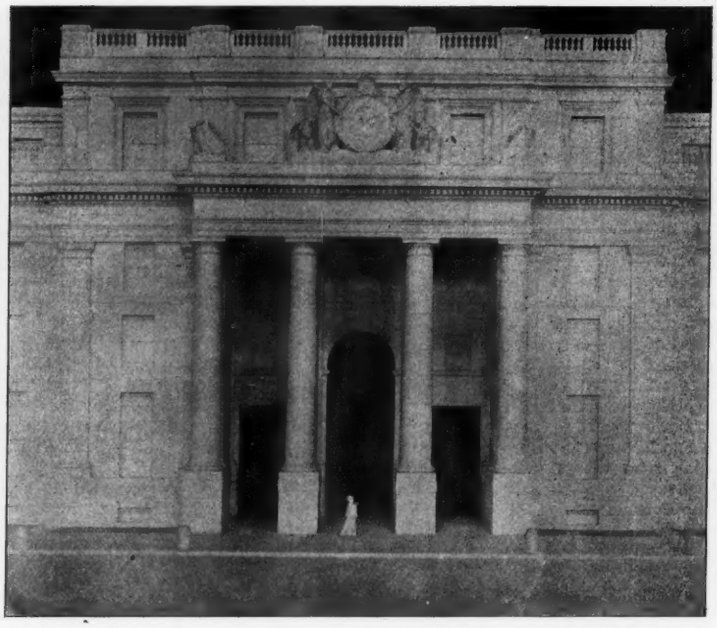
The main entrance to the building will be from Seventh avenue and the carriage



Carriage Entrance from Seventh Avenue.

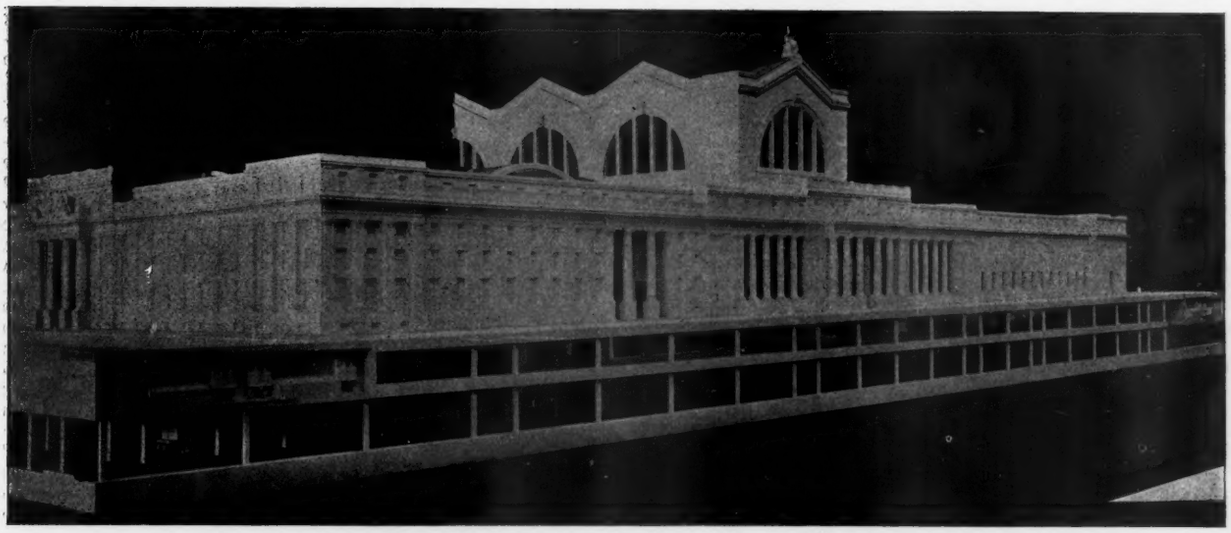


Interior of General Waiting Room.

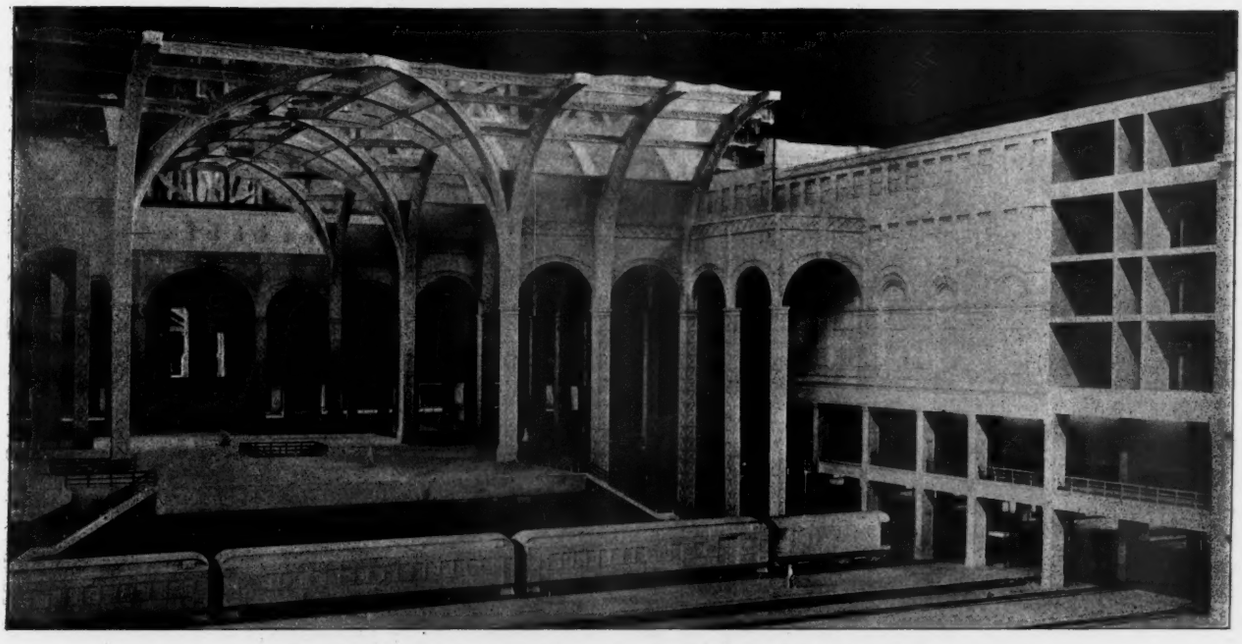


Entrance to Concourse from Eighth Avenue.

General View of Eighth Avenue Elevation Showing Tracks Beneath.



Thirty-first Street Elevation Looking Towards Seventh Avenue.



Section Through Model Showing Concourse and Train Platforms Below.

General View of Seventh Avenue Elevation.

entrances will also be on that side, flanking the main entrance. A broad arcade supported by massive Doric columns runs along the entire front of the building. There are to be entrances in the center of the 31st street and 33rd street sides and another on Eighth avenue. Architecturally, the exterior has been treated simply, almost severely, but the huge proportions of the building require such a style.

Inside, the station forms a hollow square with clear openings from the train floor up to the arched roof. The waiting rooms, ticket offices, baggage rooms and restaurant are large in proportion with the exterior of the building. A large concourse is formed on the first floor below the street level and entrances lead from this directly to the train platforms below. The illustrations show the arrangement of floors and give a suggestion of the size of the rooms.

We are indebted to Mr. Theo. N. Ely, Chief of Motive Power of the Pennsylvania, for the photographs.

Flange Wear and Side Bearing Trucks.*

BY GUSTAV LINDENTHAL.

The flange wear of rail and wheel is nearly absent on tangents and is greatest on sharp curves. A great lateral pressure is exerted on curves through the wheels bearing against the outside rail, for which three causes may be assigned: Centrifugal force, the force required for deflecting the direction of the wheels fixed on axles from a straight line, and, third, the frictional resistance of the center and side bearings on the truck.

Centrifugal force is so small that it may be neglected. The usual super-elevation of the outside rail on curves is adjusted for average speeds, at which the resultant of load and centrifugal force passes through the center of the track. In that case there is no lateral pressure against the rails, because the track is inclined at a right angle to the resultant, as shown in Fig. 1. There is of course a lateral pressure from the inclined tie transmitted to the ballast foundation, but it does not affect the rails. If the speed is greater or smaller than the average, then the resultant will move nearer the outside or the inside rail, exerting then a relatively small direct lateral pressure against one or the other. But inasmuch as

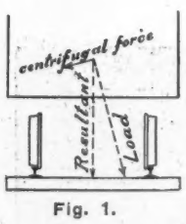


Fig. 1.

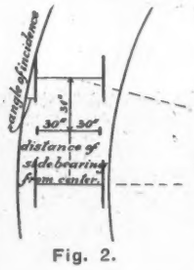


Fig. 2.

the lurching and swaying of the car brings pressure upon the side bearings of the truck, the friction in this case will hinder the truck from turning freely, and in that way an excess or deficiency of centrifugal force may be the cause of considerable flange pressure.

The lateral pressure upon the rail resulting from changing the direction from a straight line into and around a curve is more important. The truck of a heavy freight car can be taken as typical. It is a well established fact, first discussed by A. M. Wellington, in his book on Railway Location, that the front outside wheel of a truck is the only one in lateral contact with the rail. The flanges of the three other wheels do not touch the rails. Fig. 2 shows the normal position of the truck on a curve, in which the rear axle assumes the radial position. A truck with rigid frame and with the wheels rigidly fastened on the axles has a tendency to run in a straight line. On a curve it requires a large lateral force to move the wheels sideways from a straight line. If the wheels were loose on the axles, and if further the axles could assume a radial position, then the truck would exert no more lateral pressure upon a curve than it does on the tangent. Flange wear of wheels and rails would then be unknown. The construction of trucks and locomotives with radially swivelled axles, however, is impracticable.

With the four-wheel truck, the work of turning the car from a tangent into and around a curve is done by the outside front wheel, through which the entire lateral pressure of the truck against the rail is exerted. The front wheel pushes the three other wheels of the truck sideways from a straight line, in which they otherwise would

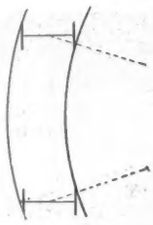


Fig. 3.

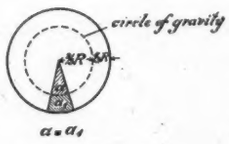


Fig. 4.

continue to roll. The slippage of the wheels by reason of their inability to turn on the axles has no appreciable influence upon lateral pressure. Assuming a heavy coal car, uniformly loaded, and with total weight of 160,000 lbs., we have on each wheel 20,000 lbs. With a coefficient of sliding friction of 0.25, the flange pressure on the front outer wheel of each truck will therefore be $3 \times 20{,}000 \times 0.25 = 15{,}000$ lbs. (or 30,000 lbs. per car). This lateral pressure is independent of the degree of curvature, but it is in direct proportion to the weight and load of the car.

If the outer front wheel were normal to the radius of the curve, there would be little flange wear, because the resultant of the vertical and lateral pressure would pass obliquely through the corner of the rail, and through the neck of the wheel flange. The flange itself would not be pressed against the side of the rail, and there would be only rolling friction along the inner edge of the rail. With new rails and new wheels, that is actually the case. Flange friction and train resistance on curves is very much less with new rails than with old, worn rails. But as the outer front wheel is not normal to the radius, its flange forms an angle with the rail (the angle of incidence). There is then side contact between flange and rail and consequent rubbing friction. It increases with the angle of incidence, that is with the degree of curvature, although the lateral pressure against the outside rail is the same on sharp curves as on light curves. The only way in which, for the usual center bearing truck, the lateral pressure from that cause (continuous change of direction on curve) could be reduced would be by lubricating the top of the rails on curves, reducing the coefficient of sliding friction from .25 to less than .03. That, however, is impracticable. The wheel treads would of course become greasy, and the tractive power of the locomotives and the holding power of the brakes would be greatly reduced. It is a choice of evils, and flange wear is the smaller of the two.

The length of wheel base has an important bearing upon flange pressure. If the base be long, as in a European car, without trucks, then the work of turning the car is performed by the front outer wheel and the rear inner wheel. The car or truck assumes then a position normal to the radius of the curve, as shown in Fig. 3. Both these wheels have flange pressures, which for each wheel is less than the flange pressure upon the front outer wheel of a shorter wheel base, as in the American truck. But the angle of incidence is greater, and both the outer and inner rail are subject to lateral pressure. Therefore, on European track, both rails on a curve show wear at the inside flange, while on American track the rail-flange wear is confined to the outer rail. It is clear that when the rear inner wheel participates in the work of turning the truck or car around the curve, the front outer wheel will be exposed to less lateral or flange pressure, and therefore to smaller flange wear. Therefore a longer wheel base than is usual for 4-wheel trucks (5 to 6 ft.) would have certain advantages in that respect. It is a fact that the wheels of the longer 6-wheel trucks show proportionately less flange wear.

Now considering by itself the friction of the center plate on the truck. Tests have been made on the friction of center plates by W. C. Squire, reported in the Proceedings of Western Railroad Club, 1898. From the tabulated results I select the pressure on center plate of 50,000 lbs. The power P required with a leverage of 31 in. varies from 3,044 lbs. for rough, unlubricated surfaces to 897 lbs. for rough, lubricated contact. Thirty-one inches is the distance given between center of plates and the horizontal axis of the axle. (See Fig. 2.) Assuming the diameter of center plate at 9 in., we can readily determine the coefficient of friction. The distance of the gravity line for a circular area is equal to $\frac{2}{3}$ radius; (see Fig. 4) for a diameter of 9 in. it is equal to 3 in. from the center. The frictional resistance of the load L on the center bearing is $f L = \frac{31}{3} P$ or $f = \frac{31 P}{3 L}$.

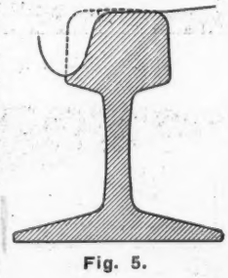


Fig. 5.

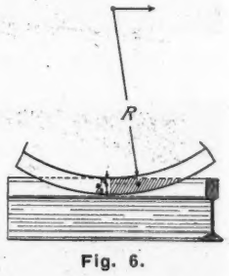


Fig. 6.

For unlubricated rough surfaces $f = \frac{31}{3} \times \frac{3044}{50{,}000} = 0.627$.

For lubricated rough surfaces $f = \frac{31}{3} \times \frac{897}{50{,}000} = 0.185$.

A fair mean value taken from Mr. Squire's table would be $f = \frac{31}{3} \times \frac{1625}{50{,}000} = 0.334$. The coefficient of friction may therefore vary from .62 to .18. A fair average value is .35, which agrees with observation and with the theoretical assumptions on center plate friction made heretofore.

Returning to the car with a total weight

*A paper read at the September meeting of the New York Railroad Club, September 16, 1904.

of 160,000 lbs., the load on each center plate may be assumed at 72,000 lbs. (without the weight of truck). For such a heavy car the center plate will be 12 in. in diameter. The distance of gravity circle from center will be 4 in. The distance from center to axle in a truck of 5-ft. 6-in. wheel base will be 33 in. Therefore the lateral pressure, p, on the outer front wheel due to friction of center bearing is, $p = \frac{4}{33}\ 72{,}000 \times 0.35 =$ 3,060 lbs., as an average, but taking the highest and lowest values, deducted from Squire's experiments, the lateral pressure against the rail may vary from 5,600 to 1,500 lbs., depending upon the condition of the contact surfaces of the center bearing.

The center plate never carries the entire load on the truck for any length of time, even with stout car and truck bolsters. The lurching of the car caused by uneven track and defective rail joints is quite noticeable on tangents and still more so on curves. It does no harm when on a tangent, but it adds very much to the curve resistance.

Let the speed be increased, or the center of gravity of the loaded car be higher than the assumed average, then a noticeable change results at once in the behavior of the center bearing car truck.

Assuming that, through unbalanced loading or through lurching, one or the other side bearing carries one-quarter and the center plate carries three-quarters of the load of 72,000 lbs. That is, 18,000 and 54,000 lbs. respectively. The side bearings are each 30 in. from the center. (See Fig. 2.) We have in this case a flange pressure, $p = \left(\frac{30}{33}\ 18{,}000 + \frac{4}{33}\ 54{,}000\right)\ 0.35 = 8{,}029$ lbs., which is more than 2½ times the flange pressure when the load is carried on the center bearing alone. If, as frequently happens, with weak framed and overloaded cars, the side bearings carry one-half the load, the flange pressure may reach $\left(\frac{30}{33}\ 36{,}000 + \frac{4}{33}\ 36{,}000\right) \times .35 = 12{,}971$ (or say 13,000) lbs. It is thus to be seen that the ordinary side bearings may increase the flange pressure more than four times the flange pressure due to center bearing alone.

It is usually assumed that the flange pressure due to friction of the center and side bearings occurs only on entering and leaving a curve. But this leaves out of consideration the elasticity of the truck. If the truck were perfectly rigid, then the motion of the center bearing would take place only on entering or leaving the curve; but the truck must pass through some elastic deformation before the friction of the center bearing is overcome. The result is that the lateral pressure against the rail, required to overcome the friction of the center bearing (or of the side bearings, if they are loaded), is more or less continuous throughout the curve. After leaving the curve the truck tends to turn back again into the normal position for the tangent, but here again the elasticity of the truck furnishes resistance and causes lateral pressure and flange wear for a certain distance on the tangent. This explains the observed flange wear on the inside rail of tangents, at the end of curves, which is puzzling to some trackmen.

Recapitulating the separate values of lateral pressure on curves, we have for the assumed loaded freight car, weighing 160,000 lbs., the following amounts per single truck:

From centrifugal force, nil.

From change of direction, with fixed wheels, 15,000 lbs.

From friction of center bearing, average 3,000 lbs., which may grow to 5,600 lbs., and, including side bearing friction, may reach 13,000 lbs.

That is, the outer front wheel of each truck in a modern heavy freight car may exert a lateral pressure against the rail varying from 18,000 to 28,000 lbs., when the vertical pressure upon the wheel is 20,000 lbs. under a car weighing 160,000 lbs., or, in other words, for each 100 lbs. vertical pressure there is from 90 to 140 lbs. lateral pressure under the front outer wheel, or, applying the relation to the whole car, the lateral pressure is from 22½ to 35 per cent. of the load of the car, be it light or heavy.

Several instructive conclusions can be drawn from this analysis. The outer rail on a curve is subject to a lateral pressure, which is from 45 to 70 per cent. of the vertical wheel pressures, assuming both pressures distributed upon a rail 30 ft. long.

Deducting friction of rail upon wooden

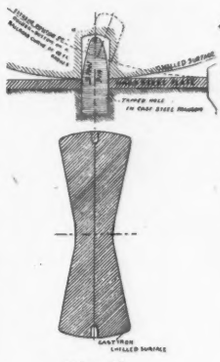


Fig. 7.

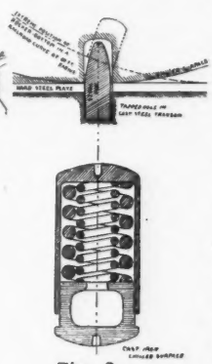


Fig. 8.

ties amounting to 30 per cent., we have 15 to 40 per cent. of the lateral pressure left to be resisted by the rail spikes. It is no wonder that the spikes in hardwood ties are sawed off gradually, and that on soft wood ties the outside rail has a dangerous tendency to spread.

On new outside rails the resultant of vertical and lateral pressures from the outer front wheels has to overcome only rolling friction. But very soon the corner of the rail is abraided (see Fig. 5), and while the vertical pressure continues to cause only rolling friction, the lateral pressure against the side of the rail gradually causes rubbing or sliding friction, the coefficient for which is probably 100 times greater than that of rolling friction. The side of the rail head may therefore grind off faster from sliding friction than the top of the rail can wear from rolling friction. This sliding friction wears off also the wheel flange of the outer front wheel, but each wheel in a truck is at one time or another an outer front wheel so all wheels wear more or less alike. Assuming that the metal of the wheel tread and flange is twice as hard and tough as the ordinary steel rail, then for every ounce of metal ground off the flange of a wheel two ounces of steel are ground off the inner side of the outer rail of curves. As pointed out before, because of the angle of incidence the flange wear of outer rails is greater on sharp curves than on flat curves.

The rubbing or sliding friction due to flange pressure affects the tractive force required for hauling the car. For sharp worn flanges 1½ in. deep, in rubbing contact with the side of the rail, the frictional resistance may become quite large. The wheel flange fits tightly against the worn rail head, which has sometimes more than half its width ground off. The vertical contact area between rail and wheel flange is a triangle, as shown in Fig. 6. The center of gravity of that area will be ½ in. below the top of rail, which can be taken as the fulcrum with the radius of wheel, 15 in. as the lever arm. If the flange pressure under a 160,000-lb. car be taken as 2×18,000=36,000 lbs., then we have, for a coefficient of friction of 0.25, a resistance $R = 0.25\ \frac{0.5}{15} \times 36{,}000 = 300$ lbs., added to the ordinary tractional resistance of that car. It may occasionally reach 420 lbs. for 56,000 lbs. lateral pressure per car. For level grades and straight line, the tractional resistance is usually taken at 4 lbs. per ton, which would be 470 lbs. for the car weighing 160,000 lbs. The flange pressure would therefore nearly double that resistance, raising it to 8 lbs. per ton on a level grade, which closely accords with observed facts on worn curves.

The flange pressure reacts also upon the car axles, which are usually proportioned only for vertical loads and impact. A 6-in. axle has a moment of resistance R, which is very nearly $\frac{d^3}{10} = 21.6$. Taking the vertical load P of 20,000 lbs., and the distance from center of journal bearing to center of hub as 8 in. we have an outer fiber stress of $\frac{8 \times 20{,}000}{21\ 6} = 7{,}400$ lbs. The outer fiber stress from lateral pressure will be $\frac{18{,}000 \times 15}{21.6}$ $= 12{,}500$ lbs., and may reach $\frac{28\ 000 \times 15}{21.6}$ $= 20{,}000$ lbs. per sq. in., showing that the axle may be strained higher from the lateral pressure on curves than from vertical pressures. And as both pressures are simultaneous, the outer fiber stress may reach $(7{,}400 + 20{,}000) = 27{,}400$ lbs., without torsional stress and without allowance for impact, which may double that stress. Therefore at times it may reach 55,000 lbs., alternating tension and compression, which is very near the elastic limit of axle steel.

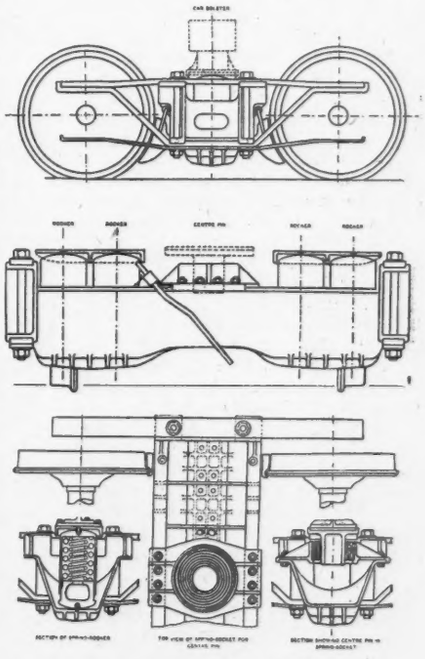


Fig. 9—Rocker Side-Bearing Truck.

As already pointed out car trucks are subject to severe diagonal stresses. The flange pressure from the outer front wheel must be transmitted indirectly to the other three wheels and to the center bearing through the diamond frame and through the truck

bolster, both subjected to bending moments tending to distort the truck, and bringing heavy secondary stresses upon its connections, which are, as a rule, much too weak to resist them. The lateral spring, or elastic resistance, mentioned above, is unavoidable, and the flange pressure from it is constantly present upon curves.

How then can the lateral pressure, so detrimental to truck and track on curves, be reduced? That portion (15,000 lbs. for the heavy car) due to the wheels being rigidly fixed upon the axles, which throws the work of deflecting them around the curve upon the outer front wheel, cannot be wholly eliminated, but it may be possible to reduce it. If the friction of the center plate could be lessened, then the rear outer wheel could come up closer to the rail and thus relieve the flange pressure upon the front outer wheel. The angle of incidence would then be also reduced. Each of these two outer wheels would exert a lateral pressure against the rail, although it might not be the same on both. A large part of the lateral pressure may still be left to the front outer wheel, but instead of the 15,000 lbs. in the case of the heavy car, there would perhaps be only 10,000 lbs., or even much less lateral pressure.

Any device that will reduce the friction of the center plate and side bearings will also reduce the flange pressure. One of the means used is greasing or lubricating the center plates on the trucks, and also the side bearings. A very considerable reduction of flange pressure and flange wear has been observed with it. But the inconvenience of lubrication and the difficulty of keeping it up have been found to be great impediments. Another plan is to do away entirely with center bearings and to rely upon nearly frictionless side bearings alone. A construction of this kind is shown in the illustration.

The side bearings consist in principle of large cast-iron balls (about 26 in. in diameter) on which the car body rests. Two such balls as a rule are used for each truck. The sides of the balls, being useless, are cut away, so that the form is that of columns or rockers, with spherical ends, which have hard chilled surfaces. In place of the center bearing there is a center pin or pivot, having a loose fit in a spring socket. It can take no vertical pressure, but the spring socket protects the pivot and so the truck frame against lateral shocks. The columns rest in pockets, one at each side of truck, and may have different forms. They may be rigid, or each column may consist of two telescopic parts containing inside spiral springs, giving it the action of a rubber ball. There is only rolling friction at top and bottom of these columns, the coefficient of which will hardly exceed .001, even with unmachined surfaces, liable to get gritty with cinder and dirt. Reverting again to the heavy freight cars, taking the weight on the rockers at each car end at 72,000 lbs., the rolling friction of both side bearings will be about 72 lbs. The lateral or flange pressure per truck from that cause alone will then be $\frac{30}{33}$ 72 lbs. = 60 lbs. against 3,060 lbs. with the center bearing. This is in the proportion of 1:46. Moreover this small resistance from the rocker side bearings will only occur on entering and leaving the curve, whereas in a center bearing truck the friction of the center plate causes the flange resistance to continue throughout the curve.

If the flange pressure arising from fixed wheels can be reduced from 15,000 to 10,000 lbs., we would then have a total flange pressure of 10,000 + 60 = 10,066 lbs. against the total of 18,000 to 28,000 lbs. in the case of a center bearing truck, or from 40 to 65 per cent. less. As the flange wear is in direct proportion to flange pressure, there would be a saving of 40 to 65 per cent. in the wear of wheel flanges. The flange wear of rail heads would also decrease, but would not be noticeable, unless all trucks or a large proportion had rocker side bearings. The reduced curve resistance by reason of decreased flange pressure would also permit of hauling, with the same locomotive in any given train, more cars, when equipped with nearly frictionless side bearings.

Tie-Plates on the Southern Pacific.

The Southern Pacific uses, perhaps, more tie-plates than any other railroad in the United States because of the fact that a large proportion of the ties in its tracks are California redwood, which is valuable because of its resistance to decay, but which is also very soft and is rapidly cut by the rail base. In 1890 this company designed the flat bottom tie-plate shown in Fig. 1, and large numbers of them have been used with excellent results, but on account of the heavy increase in wheel loads within the last few years it has been deemed advisable to increase the thickness from ⅝ in. to $^{7}/_{16}$ in., and to place the rail more nearly central on the plate. The new form of plate is shown in Fig. 2. It will be seen that the upper surface has been recessed and the rail base bears on three ribs. This lightens the weight and also allows particles of sand and grit which might cause serious wear between the plate and rail, to work out from under the bearing surface. The plates are made in two sizes, one 9 in. wide for 9-in. ties and the other 8 in. wide for 8-in. ties; the length is the same for both, 9 in. All of these new plates will be rolled in the railroad company's own rolling mill, which is operated as a part of the company's principal shops at Sacramento, Cal.

We are indebted to Mr. J. H. Wallace, Engineer of Maintenance of Way of the Southern Pacific, for the drawings and information.

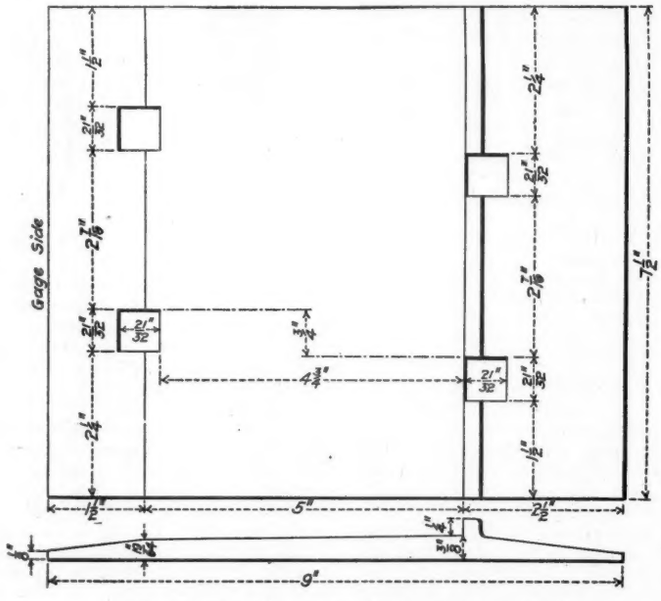


Fig. 1—Old Form of Tie-Plate, Southern Pacific.

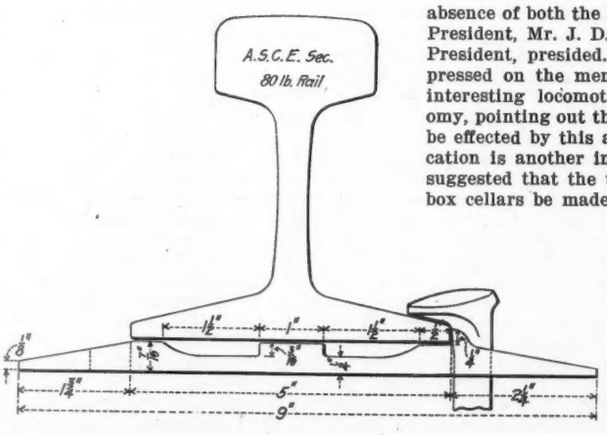


Fig. 2—New Tie-Plate for 80-lb. Rail.

The Traveling Engineers' Convention.

The twelfth annual meeting of the Traveling Engineers' Association was held in the Lexington Hotel, Chicago, September 13th to 16th inclusive. In point of attendance it is the best convention the Association has had, 267 members having registered. In the absence of both the President and First Vice-President, Mr. J. D. Benjamin, Second Vice-President, presided. In his address he impressed on the members the importance of interesting locomotive crews in coal economy, pointing out the great saving that could be effected by this alone. The cost of lubrication is another important matter, and he suggested that the use of grease in driving box cellars be made the subject of a topical discussion. Electricity as a motive power was a matter members could not much longer neglect and he advised giving the matter attention.

The Secretary reported a total membership of 503, the net gain for the past year being 57, or 13 per cent. The Treasurer reported a cash balance of $400.

Mr. E. R. Webb's paper on "The Future Engineer—How Can Good Material be Obtained and Retained," was the first discussed. Mr. W. G. Wallace (C. & N. W.) thought all traveling engineers must en-

counter good material in their travels over the line—strong, intelligent young fellows without much education. The Delaware, Lackawanna & Western puts its prospective firemen on the ash tracks for a three months' term on the theory that a man who will stick to that work for the full time will make a good fireman. They have best success with farmer boys, section men and others from classes accustomed to heavy labor.

The matter was declared to be one that is giving the roads a good deal of trouble, as it is not easy to find firemen having the proper qualifications combined with the perseverance to become enginemen. One of the things to be observed in retaining good material is, not to load the engine down to the last ton. This practice, in conjunction with pooling, which keeps the average engine in poor condition, makes excessively hard the labor of the engine crew. Other points are not to give the men too long runs, and have the cabs comfortable for them, especially in winter.

Some interesting testimony in regard to the relative advantages of pooling and of single crews for locomotives was offered. In all cases it appeared that either where the pooling system had been lately abandoned, or where the two practices were respectively in force on adjoining divisions of a road, the engines with regular crews made noticeably better mileage and the interest of the firemen in their engines was much greater. The convention finally passed a resolution to the effect that the road foremen of engines should be permitted to employ all firemen and that they should endeavor to retain them by proper encouragement and instruction and should use their best efforts to make their surroundings as pleasant as possible.

Passing to the committee report on the "Progressive Examination of Firemen and New Men for Employment," the discussion turned on a suggestion that the association supply the answers to the questions prepared by the committee. Some were of the opinion that if this were done candidates would memorize answers without understanding their true meaning; whereas, if they were obliged to "dig up" the information they would be sure to have the required knowledge. Others suggested that the candidates' knowledge, where the answers are supplied, could be quickly tested by an oral test, following the written examination. The report of the committee was finally adopted as submitted, a motion to supply the answers to the questions having been rejected.

Discussion of the report on "The Water Tube" diverted to the brick arch, and little was said relative to the desirability of the tubes, or the reverse. This little was in line with the statements in the report in regard to difficulty of keeping clean, liability and danger of failure. In regard to the life of such tubes, Mr. C. B. Conger had run an engine with a set of these tubes for two years before removing them, although the rule on the road was for removal at the end of six months. This he attributed to the almost exclusive use of good water, the size of his tank and the service in which the engine was engaged, enabling him to "run" bad water tanks. The final action was that circulating tubes are economical where conditions permit their use.

Mr. Ira C. Hubbell (K. C. M. & O.) read his paper on "Valve Motion—Its Relation to Steam Economy." Replying to a question, Mr. Hubbell said that Allfree-Hubbell locomotives could be equipped with larger exhaust tips than the corresponding locomotive having one of the usual valves. Asked how proper draft could be obtained with a lower terminal pressure and larger tip, he explained that the quick and full opening of the valve permitted the exhaust steam to rush out instantly, in full volume, filling the stack and giving the requisite draft. Furthermore, the lower release pressure does not tear the fire, permitting a lighter one to be carried than ordinarily, therefore less pressure is needed to create the requisite draft.

Mr. W. M. Boughton, of the Pere Marquette, said they have had three Allfree-Hubbell locomotives in service for nearly a year. They are moguls and are on fast merchandise runs. They are always ready to go out, the three not having lost to exceed two weeks altogether since they have been in service. They will run 20 per cent. further on a given amount of coal and water than any other engine on the division. Also, they are the liveliest engines he has ever ridden on.

The paper on "The High-Speed Brake" by Mr. L. M. Carlton (C. & N. W.) was next presented. Mr. F. M. Nellis thought that lubrication of the triple slide valves should be looked after more carefully than in the standard triples; that a better grade of oil should be used and applied oftener, as the higher pressure would tend to squeeze the oil out from under the valve. Also, moisture in the train pipe causes these triples to go into undesired emergency and greater care should be exercised to keep this moisture out.

Following this was some discussion relative to the functions of the reducing valve, Mr. J. P. Kelley (N. Y. A. B. Co.) asserting that its most important function was the production of uniform conditions throughout the train; that it is not a preventer of wheel sliding, and that high terminal cylinder pressures do not cause slid-flat wheels, although there will be sliding at the instant of stopping. Mr. Nellis disagreed with the assertion that it does not prevent wheel sliding, citing the experience of the Pennsylvania, which previous to the use of the reducing valve had a very considerable number of slid-flat wheels each month. Since then there have been few. In answer to a question as to how much further a train would require to come to a stop with all wheels locked by brakes, than under usual conditions, he said he knew of but one instance where this occurred under test, being in a trial on the Pennsylvania. The wheels locked at 45 m.p.h. and the train ran 33 per cent. further than it would otherwise have gone. On the other hand, on an experimental electric train on a New York elevated road, the stop was shortened 10 to 15 per cent. under similar conditions, due to the absorbing of the rotative energy of the revolving parts.

The final paper was "Headlights—Location, Type, Operation and Care," by A. L. Beardsley (A., T. & S. F.). There was considerable discussion in regard to the best place to set the turbo-generator and where to run its exhaust pipe. The paper advocated putting the machine just in front of the cab and running the exhaust pipe up over the top of the cab. A member from a road having tunnels on its line had trouble from sand and cinders, which worked into the machine, causing hot bearings. They were therefore moved up in front of the stacks. Introducing the exhaust pipe into the front-end gave trouble in all cases, and some overcame the trouble by running the pipe up inside of the stack to near, or above, its top. There was much favorable testimony in regard to the value and desirability of the electric headlight and a number of instances were cited where wrecks were averted by its use.

Mr. McManamy (P. M.) said they were using a double-carbon lamp in preference to having a copper negative, had speeded up the dynamo and were getting much better results than formerly.

There was some talk on the breakage of headlight glasses. One member said that an objection to strip glasses was that they permitted the reflector to get dirty quickly. The Santa Fe decreased breakage of solid glasses by substituting a wooden retaining rim for plaster of paris. Otherwise nothing new was offered.

Mr. W. J. McCarroll, of the Baldwin Locomotive Works, on Friday morning gave a lecture on Baldwin balanced compound locomotives, illustrated by stereopticon views. Starting with the one built for the Plant System in 1902,* a view of which was shown, the next was the Santa Fe design, and lastly that for the Burlington. Details of design and particularly of the revolving and reciprocating parts were dwelt upon, showing how the balancing is accomplished. In conclusion, the fine performance of No. 2,700 of the Burlington on two runs over its division from McCook, Neb., to Akron, Colo., was related. The division is 143 miles long and in that distance there is a total rise westbound of 2,044 ft. On the first run with a passenger train of 10 cars weighing 644 tons, 39½ minutes were made up. On the second run there were 12 cars weighing 719 tons and 13½ minutes were made up.

Following this Mr. S. M. Vauclain addressed the meeting on the same subject. He said that because American builders had only recently undertaken to build balanced compound designs was no indication that they had previously been oblivious to their advantages. But they could not ask Americans to accept the complicated foreign designs and a simplified American type had to be worked out that still was equivalent or superior to the foreign designs. He referred to the chief difficulty in the way of the adoption of the balanced compound in this country, which has been the deep-seated aversion to the crank axle. This was due to breakage in early times. Yet plain axles break, even nowadays when they are scientifically designed. There is little cause to wonder that crank axles broke in those days of unscientific design and poor material. He related some of the difficulties they encountered in trying to get crank axles when they built their first balanced compounds, of thoroughly investigating European practice and finding that they are still experimenting after 70 years, and of finding that their most successful design is a built-up one. The Baldwin Works can now produce an entirely satisfactory built-up crank axle and at a rate which will enable them to respond to almost any demand for locomotives.

A topical discussion on the subject of grease as a lubricant for locomotive driver and rod bearings brought out information on the experience of the D., L. & W., which is probably the pioneer in this practice. Mr. Talty said that on his division were 21 engines so equipped, and they were experiencing no trouble from hot bearings. On consolidation engines with 50-in. drivers, 21 in. x 26 in. cylinders, 1 lb. of grease for driving boxes and rods was good for 447 miles; on passenger engines, 465 miles; and on yard switching engines 7,500 miles. He thought any road could get rid of hot bearing troubles by the use of grease. Mr. Bickel said the Lake Shore has 40 engines on his division using grease. Mr. Talty spoke of a difficulty they formerly had, due to the "doper" when applying grease to the cellar of a new bearing or one just from the shop. He would smear some grease on the inside of the perforated plate, for initial lubrication until the grease in the cellar began to have effect. But this coating, when the bearing got hot, would burn hard and form a

Railroad Gazette, Feb. 28, 1902.

scale, preventing the grease in the box from being forced through the plate by the spring beneath. In response to a question as to whether the wedges could be adjusted as closely as with oil, he said not, but that they could be kept close enough not to cause any injury.

Those who had tried grease for the trailing truck wheels had not found it a success. Solid brasses and also brasses with babbitt strips are used in the rods.

On motion, the committee on front-ends was allowed further time to prepare its report, and it will be presented at the next convention.

Section 3 of the By-Laws, relating to the selection of the place of meeting, was modified. The convention will vote on the places nominated and from the five receiving the highest number of votes the Executive Committee will make a selection, preference being given to the place receiving the highest number. Should objections or obstacles develop, the next highest will be investigated, and so on.

The new subjects for the next convention are:

Committee Reports.

1. Grease as a lubricant for all bearings of locomotives. 2. What system will enable the road foreman of engines to keep the best record of tire wear? 3. What devices for. and arrangement of, engine and tender will lighten the work of engineman and fireman? 4. Bell ringers, sanders, water scoops and other devices operated by compressed air; their care and arrangement to get the best results.

Individual Papers.

1. Electric motors, and instructing men to handle them. 2. Injectors. Modern Practice. 3. The latest makes of lubricators, their operation and maintenance. 4. Mechanical stokers.

The officers for the ensuing year are: President, J. D. Benjamin (C. & N. W.); First Vice-President, A. L. Beardsley (A., T. & S. F.); Second Vice-President, W. J. Hurley (N. Y. C. & H. R.); Third Vice-President, A. M. Bickel (L. S. & M. S.); Treasurer, C. B. Conger (I. C. S.); Secretary, W. O. Thompson (N. Y. C. & H. R.), re-elected; Members Executive Committee, J. A. Talty (to fill an unexpired term), W. H. Corbett, W. P. Steele and W. G. Wallace.

The cities from which the Executive Committee will select the next place of meeting are Denver, Chicago, Detroit, Chattanooga and Norfolk, in the order given.

Exhibits.

American Locomotive Equipment Company, Chicago.—Sarver auxiliary exhaust valve, Sarver automatic steam chest choke, Wade-Nicholson hollow arch, Moore journal box cellar, "Northern" metallic packing, and Curran chime whistle.

C. B. Ault, Chicago.—Scott valves.

F. L. Brewer, Blue Island, Ill.—Brewer pneumatic fire-door opening apparatus.

Crandall Packing Company, Palmyra, N. Y.—Samples of throttle and air-pump packing.

Joseph Dixon Crucible Company, Jersey City, N. J.—Pamphlets describing graphite as a lubricant.

Garlock Packing Company, Palmyra, N. Y.—Samples of throttle, air pump and steam hammer packing.

Hancock Inspirator Company, New York.—Sectional model of 5,000-gal. per hour injector. Samples of check valves.

N. L. Hayden Manufacturing Company, Columbus, Ohio.—Samples of Hayden metallic packing for air pumps, piston rods and valve stems and of the Hayden locomotive pop valve.

Homestead Valve Manufacturing Company, Pittsburg, Pa.—Samples of blow-off cocks and high pressure valves.

H. W. Johns-Manville Company, New York.—Fireproof construction materials for electric railroads, Vulcabeston and asbestos packings, magnesia locomotive lagging and "fire felt" train pipe coverings.

J. S. Leslie, Paterson, N. J.—Leslie pressure regulator.

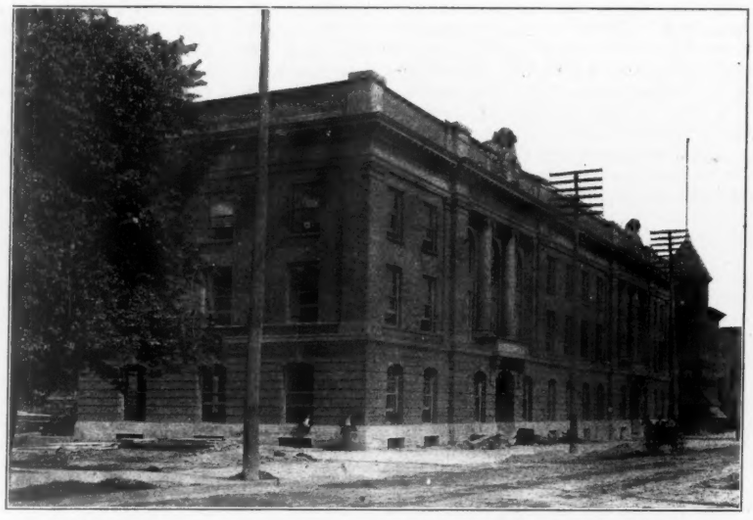
Michigan Lubricator Company, Detroit, Mich.—Bull's-eye triple sight-feed locomotive lubricator.

Naber Spring Company, Chicago.—Locomotive engineman's seat.

Nathan Manufacturing Company, New York.—Nathan bull's-eye locomotive lubricator and "Reflex" water gage.

Storrs Mica Company, Owego, N. Y.—Mica headlight chimneys and lantern globes, and color disc for classification lamps.

Thurston Automatic Lubricator Company, Chicago.—Thurston automatic lubricator.



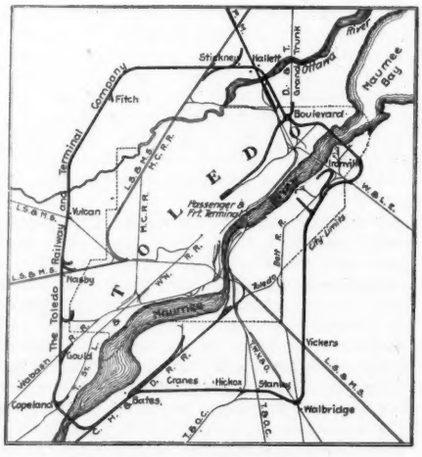
Toledo Railway & Terminal Co.'s New Station at Toledo, Ohio.

New Passenger and Freight Terminal of the Toledo Railway & Terminal Company.

The inclusion of the Toledo Railway & Terminal Company in the recent combination to form the Cincinnati, Hamilton & Dayton System makes of especial interest the terminal improvements which the former has had under way for some time. Last year the construction of a combined passenger and freight terminal was begun in Toledo on a tract of land bounded by Cherry, Seneca, Oneida and La Grange streets, two intervening streets, Walnut and Locust, having been vacated. This gave a space fronting 200 ft. on Cherry street and running back 1,350 ft. to La Grange. The accompanying map shows the belt formed by the Terminal Company's line, its relation to all roads entering Toledo, and particularly to the Cincinnati, Hamilton & Dayton and the Pere Marquette. It forms the physical connection between these two properties and secures to them important and valuable terminal facilities.

Passenger trains of both of these roads will, however, continue to run into the old Union depot. All through southbound trains from the Pere Marquette will be turned over to C., H. & D. train crews at before arriving at the Union station and will be handled as C., H. & D. trains into the station. Northbound through trains will be handled out of the station by C., H. & D. crews and turned over to the Pere Marquette at the boulevard, some distance out. The northbound C., H. & D. trains will head into the Union station and back out to Bates (the junction of the C., H. & D. and Terminal), where they will go onto the terminal tracks, while the southbound trains will back in from Bates and head out over the C., H. & D.

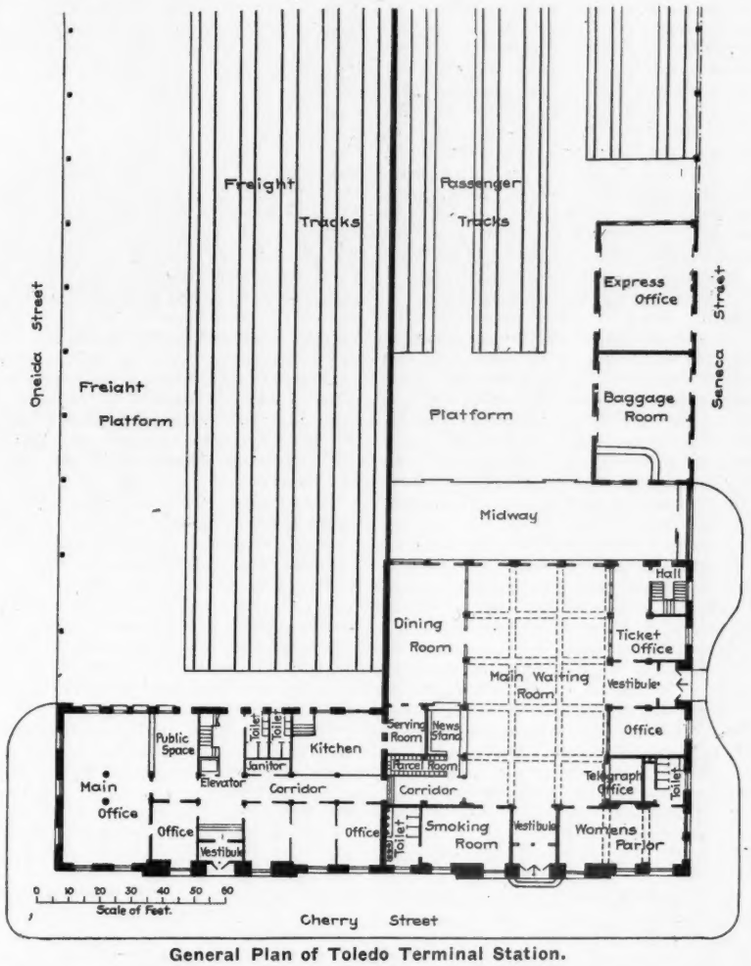
The location of the new passenger and freight terminal is shown on the map. The building proper, including freight and passenger sheds, is 200 ft. x 425 ft. The headhouse is a three-story building with basement and attic, and presents a fine appearance. It was completed outside last fall, but only the freight part was finished on the interior. In anticipation of its occupation by the leasing system, the interior of the passenger part is now being finished. Although the freight and passenger portions divide the Cherry street frontage equally, the former is only about half as deep as the latter,



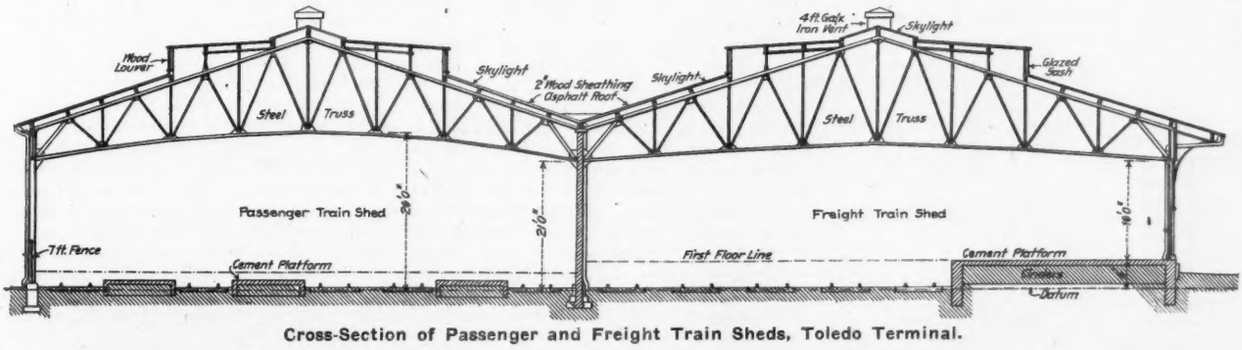
The Toledo Belt Railroad.

these dimensions being 52 ft. and 100 ft. respectively. The headhouse is Bedford limestone up to the window line. Above this the body of the building is pressed brick, the trimmings being limestone and terra cotta. The passenger section has entrances from Cherry street, at the front, and Seneca street, on the east side. Both are through vestibules leading directly into the main waiting room. This latter, which is 44 ft. x 75 ft., is a handsome room, extending through two stories and lighted largely from above. It is finished with a mosaic floor and high mar-

ble wainscot. Plaster pilasters, spaced 14 ft. 4 in. apart around the walls, with marble bases and ornamental plaster caps, are surmounted by an ornamental plaster frieze and cornice. Between pilasters, above the marble wainscot, are rectangular plaster panels with wood cornices and trimmings. Above these



General Plan of Toledo Terminal Station.



Cross-Section of Passenger and Freight Train Sheds, Toledo Terminal.

are lunette panels, five of which contain windows of amber-tinted ripple glass in wooden bars. For the remainder, the panel within the arch is plaster, while the small triangular panels between the arch and the frieze are plaster for all of the sections. All vestibules, corridors and other public parts of the building are finished with mosaic floors and high marble wainscots with plaster panels above.

The smaller rooms and offices are grouped on three sides of the main waiting room, the men's smoking room and the women's parlor flanking the Cherry street entrance. The ticket office occupies the space between the Seneca street vestibule and the midway. On the opposite side of the main waiting room is the dining room, its kitchen being in the adjoining corner of the freight portion of the building. The dining room part of the building is only one story high and is lighted from above like the main waiting room.

Between the headhouse and the train platform is a midway 25 ft. wide. It is roofed over and is lighted from above by skylights. An iron fence separates it from the train platform and also from Seneca street. A part of the train platform next to the midway and extending 82 ft. along Seneca street, is occupied by the baggage and express rooms. They are 32 ft. wide and have brick walls and cement floors. There are five passenger tracks, three of which are 240 ft. long inside the train shed and the remaining two, 180 ft.

The first floor of the freight section of the headhouse, except the part already referred to as containing the kitchen for the passenger section, contains the necessary offices for the transaction of freight business with the public. The second and third floors of the building are given up entirely to offices, with the exception of a room immediately above the ticket office and Seneca street vestibule. It will be observed that a stairway hall opens off of the midway. The stairway it contains leads to this second-floor room, which is a trainmen's room, and is provided with baths and other conveniences for their comfort.

Train sheds which are practically duplicates protect the freight and passenger tracks. The trusses for the former span 103 ft. while the span of the latter is 8 ft. less. A brick wall separates the two sets of tracks, and supports the trusses at their inner ends. Their outer ends rest on steel columns. The passenger tracks are separated from Seneca street by a 7-ft. iron fence with its panels between these columns.

The freight shed is entirely enclosed on three sides and partly on the fourth. The plans show it to contain five tracks and a raised concrete platform, 39 ft. wide, on the street side. Since the completion of the plans it was decided that difficulties would result from an attempt to operate all five tracks from a single platform at one side. Track 4 from the present platform will therefore be replaced by a platform extending the length of the shed. The street side of the present platform is enclosed by sliding doors which occupy the panels between columns. The end of the platform is protected by Kinnear steel rolling doors.

As the headhouse and sheds occupy only 425 of the 1,350 ft. between Cherry and La Grange streets, there is room to reproduce twice the present freight shed fronting on Oneida street, giving an outbound and an inbound house and also a storage house, if need be. Acknowledgments are due Mr. T. F. Whittelsey, General Manager of the Toledo Railway & Terminal Company, and Mr. George S. Mills, Architect, Toledo, for data courteously furnished.

The Chamber of Commerce of Cassel, basing its statement on the experience of the important Henschel Locomotive Works in that place, reports that while the year ending with June, 1903, was very unfavorable to locomotive builders, the last half of 1903 was not much better. Competition reduced prices for German railroads very nearly to cost, while pools kept up the prices of nearly all materials; and in at least one instance, boiler tubes, advanced them; and foreign orders could be secured only by bids below cost. As most of the countries which might be customers of Germany contemplate increasing their duties on locomotives, unless the government prevents this by reciprocity treaties, the German locomotive works must cease to export, notwithstanding the good reputation they have secured.

Test for Brittleness in Structural Steel.*

BY J. P. SNOW.

It is felt by many users of structural steel that mill inspectors should give more attention than is now usual to the detection of brittleness in our bridge material. Brittleness may be due to improper heat treatment or to segregated carbon or phosphorus. These defects may occur in material rolled from part of the slabs derived from a given ingot, while material rolled from the same melt or even from other slabs of the same ingot may be exceptionally good. If the ordinary tensile and bending tests of the heat from which the material in question is derived should be taken from those parts where objectionable segregation had not occurred and which had received proper heat treatment, the results would not expose the brittle features of the part supposed to be bad.

The desideratum is a practical method of testing, which will furnish the inspector a means of detecting brittleness in any piece that comes from the rolls that he suspects may be objectionable. The object of this paper is to suggest a scheme which seems to me to answer this requirement. Prime essentials of a test of this sort are simplicity and quickness of accomplishment. Mill men say, with reason, that they cannot hold stock until machine finished samples can be prepared and elaborate tests made. I am informed that much of the material now being used is many miles from the mill, on its way to the fabrication shop before the testing machine work is done on the specimens that are supposed to determine whether the material is to be accepted or rejected.

Determining the temperature of the metal after or before the last pass through the rolls is neither efficient, precise, nor conclusive. Delaying the piece before the last pass until the right temperature is reached refines only the outer skin of the material. It is not the function of buyers to tell the manufacturer how he shall produce his steel or at what temperature he shall roll it, but rather to ascertain if the product which he offers is suitable for their uses. This can be best accomplished by testing the finished product in a direct way.

The scheme herein proposed is in substance a nicked bending test on crop ends of plates and shapes as they are trimmed at the rolling mill for shipment. A nicked bend is proposed because the object is not so much to see if the specimen will bend without fracture, as to open up the grain of the steel to see whether it is fine and silky or coarse and crystalline.

It is proposed to take a generously wide piece of crop end so that the effect of the shear at the edges will not affect the result. It is deemed unfair to the manufacturer to depend upon narrow sheared specimens for this scheme of bending, because the injurious effect of the shear should not be assessed against the quality of the steel. Punched specimens are ruled out for the same reason. If narrow specimens with milled edges or punched specimens with reamed holes are used, the vital element of quickness of accomplishment is lost; for, while the specimens are awaiting their turn at the finishing machine the plate or shape from which they are cut is loaded for shipment or covered up in a pile of other stock. The scheme proposed will tell its story, if desired, before the rolling heat has left the piece. It can be executed and a decision reached, almost as quickly as the surface inspection of a plate can be made.

In detail the scheme is: to shear from the crop end a piece, say 12 in. wide, and nick it about three inches from one edge, preferably across the direction of the rolling, with a tool made for that particular thickness; clamp it in a hydraulic vise, and bend the free end over by power. Both the vise and bending roller are to be actuated by hydraulic power which is always available in a rolling mill. The nick is proposed to be made with a tool like a blacksmith's flatter, having a raised bead on its face.

Nicked bending tests by impact have been recommended in the past by many investigators. In 1892, Le Chatelier advocated such tests before the French Committee on Methods of Testing, and since that time work on these lines has been done by Barba, Considere, Le Blant, Aucher, Frémont, Osmond and Charpy in Europe and by S. Bent Russell and others in this country. All of these experimenters sought to determine the resilience of the material by impact tests, thinking to replace the ordinary tensile tests by these determinations. But as shown in Johnson's "Materials of Construction," impact testing is surrounded by so many uncertainties that it has never been found commercially practicable for structural materials. Evidently the constant effort has been to make the test prove too much. In the scheme herein advocated the object is not a complete physical test of the material but simply an examination of the grain, as shown in the fracture, to ascertain if the material is brittle from any cause.

To insure a fracture in ductile material, the deformation must be localized by a nick. The form of the nick, its depth and shape must be determined by experiment, but for a beginning it is suggested that a depth of one-eighth the specimen be tried, the bead with which the nick is made to have the form of the Whitworth screw thread. Investigation may show that a single size of nick may be used for different thicknesses, but it is probable that each thickness should have its particular size. The nicking die may be struck by hand hammers, or a light quick acting steam hammer may be provided for the purpose.

As to the method of producing the deformation it is possible that the distinctive difference between material that is good enough to be accepted and that which ought to be rejected cannot be brought out by making the bend with a press. It may be necessary to use impact, as was done by Fremont in a series of experiments described by him at the Budapest meeting of the European Railway Congress. These experiments show that a ductile steel may be broken short off by a blow of sufficient velocity. We know that ordinary structural steel when nicked and bent will invariably break unless it is exceptionally ductile and in very narrow specimens; hence it seems that a press bend on a wide specimen will certainly produce a break and show up the grain. A press bend if effective is preferable to a blow, on account of its more certain action and because it does not need adjustment for different thicknesses as would be needed if the bending was done by a blow.

It is believed that a test of this kind will expose coarse grain in steel, due to improper heat treatment, segregation, bad chemistry or any other defect that tends to brittleness. The engineer may, under present specifications, demand certain chemical and physical qualities when buying steel. He may not be justified in prescribing the exact ratios of the many "ites" or the precise "eutectic values" of the various compounds that enter into the material which the manufacturer gives him for steel, but he may reasonably demand simple tests like that advocated here to satisfy himself that the material is free from brittleness.

In the past, when puddled iron was the usual structural material, engineers depended largely upon bending tests to ascertain the quality of the output of the mills. Mr. C. C. Schneider has told me that he cared little for the tensile strength, elongation and other physical features of wrought iron as determined by the testing machine, but that he set great value on cold bending tests of scrap ends. Sir Benjamin Baker, when engaged upon the Forth bridge stated that he placed more reliance upon bending tests of mild steel than upon testing machine determination. With the steel of the present day we must test for ultimate strength to secure a grade that can safely undergo the ordinary shop manipulations and examine the chemistry to secure uniform composition, but have we not too much lost sight of the valuable old time feature of bending? The ordinary plain bending will not always show us the grain of the steel. In fact the width of the specimen and the radius of the bend are so selected in our usual specification that ordinarily good material will bend without fracture. Its ability to do this is the gage for acceptance. To this end the sheared edges are planed, which defeats the very purpose of the test desired on account of the time involved in the operation. Moreover, we bend but one specimen for each melt, which assuredly does not attempt to control the rolling heat.

It is true that the proposed test may involve closer attendance of the inspector at the mill than our usual commercial testing requires, and it may be impossible to define the lines by which an inspector shall be governed in rejecting material, as sharply as can be done under our present system, but the inspectors' attendance can be arranged for and the results reached by Frémont give us a clew to what may prove to be a proper criterion for acceptance or rejection.

Frémont's paper shows that when a specimen of non-ductile material is bent, a hardened ellipse tends to form on the compression side which acts as a heel around which the fibers on the tension side have to stretch. If the specimen is nicked, this stretch is localized and confined to the fibers at the bottom of the nick, and breaking is sure to occur as is explained in detail by Frémont. If the material is somewhat ductile and the specimen narrow, the compressed metal flows outward. This flowing out assists compression and tends to decrease the stretch required on the tension side by removing the heel farther from the tension face, and hence helps toward a gradual break instead of a short one. This consideration explains the well-known fact that wide specimens will not bend so successfully as narrow ones.

If in the proposed nicked bend the specimen should break around Frémont's "ellipse of enlargement," instead of square across; or if it did not break clear through, we could safely conclude that the material was not brittle. If the break was square across and the fracture silky or but partly granular, we could presume that the heat treatment was good and segregation not excessive; but if the fracture showed crystalline facets or appeared dull and cokey it would be ground for rejection. After sufficient careful experimenting I am sure that workable limits can be fixed upon for the guidance of inspectors. It is possible that thick and thin material cannot be brought to follow the same law, but rules can be established for varying thicknesses. Material that is known to be good and that which is known to be bad, both from overheating and segregation, can be experimented upon and safe extremes established.

Metallurgical literature is filled at present with complaints of poor structure in rails and to some extent in other steels. The complaint is not quite so common in regard

*Read at the Atlantic City meeting (June, 1904) of the American Society for Testing Materials. A companion paper, by W. R. Webster, was printed in *The Railroad Gazette*, July 22, 1904.

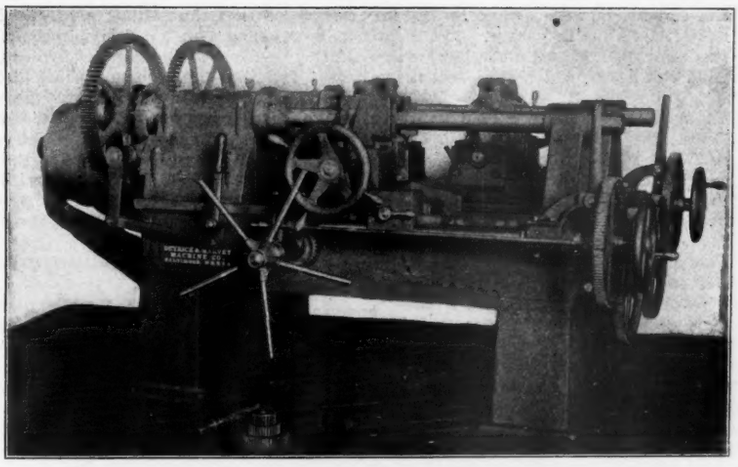


Fig. 1—The Detrick & Harvey Double Car Box Boring Machine.

to structural steel, for the reason, probably, that it is usually in thin sections which cool to a lower temperature than thick ones, while passing the rolls. It is the case, however, that rolled beams have sometimes proved so brittle and untrustworthy that some engineers dislike to use them in railroad bridges. It is likely that the principal reason for this condition is too high heat during the rolling, due to their heavy section. If the crop ends of such beams are sheared up so that a section of the web or flange can be nicked and bent in the proposed machine the coarse structure, if it exists, will surely be exposed and the beam saved from discrediting its species when put into service.

A similar test on crop ends of rails could be made with the rails while passing the straightening press and many of those having coarse structure at center of head, open grain, lamination, pipes, sulphur flaws or other defects that one drop test in five heats does not detect, would be saved from going into the track and causing trouble for both user and manufacturer.

It is intended to supplement the usual tests for physical qualities and is suggested as a means of satisfying buyers of steel that their material is sound and free from brittleness. It is cheap in installation and operation and requires the inspector's continuous attendance at the shearing end of the rolling mill where he belongs. If properly executed it should tend to allay the agitation that is now going on among users of rails and structural steel in regard to heat treatment, open grain and other rolling mill defects. If the scheme is objectionable to manufacturers it is respectfully offered for their free criticism.

Railroad Shop Tools.

(Continued.)

BORING MACHINES.

The double car box boring machine shown in Fig. 1 is made by the Detrick & Harvey Machine Company, Baltimore, Md. The machine consists of a bed having two pairs of ways on its top surface; on each pair of ways is mounted a headstock carrying a revolving spindle, to which is attached the boring bar; the other end of the boring bar is carried in bushed bearings at the other end of the ways. On the ways between the headstock and the bearings are mounted traveling carriages, and on the top of each carriage is mounted transversely two jaw carriers operated by a right and left hand screw. The machine is driven by a three-step cone for a 4½ in. belt; the largest step is 21⅞ in. in diameter. The cone is geared to the spindle through a spur gear; each spindle can be stopped independently while machine is running, thus the setting of boxes for one bar does not interfere with the other pair of boxes.

The carriages are strongly ribbed castings gibbed down to the bed and operated by hand through a rack and pinion, and by hand or power through a lead screw with an operating nut. Transversely across the top of the carriage is a square locked tongue on which is mounted two sliding blocks tapped one each right and left hand, and operated by a right and left screw, to which is attached a handwheel. These sliding blocks are flat on top and to them are attached by bolts the gripping jaws for holding the boxes. The jaws are changed for each size box and with each pair of jaws are a top and a bottom spacing block; the bottom block stays in position and the boxes are set in the jaws resting on the bottom spacing block; the top spacing block is put in place and the jaws are screwed up tight by means of the handwheel and the boxes are then bored and filleted.

The power feed is applied through lead screws to the carriages; the feeds furnished are three in number. The feed spur on the end of lead screws is provided with a clutch so that the feed can be thrown out at will and the feeding be done by hand. The opening nuts can also be thrown out and the carriage rapidly traversed by hand. The boring bar is $2^{15}/_{16}$ in. in diameter for standard machine, but other size bars may be used. Each bar is provided with three slots for cutters, i.e., a filleting cutter at each end and a boring cutter in between. A short master bar is furnished with each

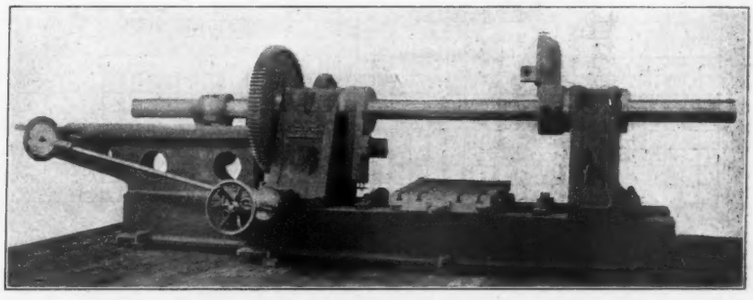


Fig. 2—The Newton Locomotive Cylinder Boring Machine.

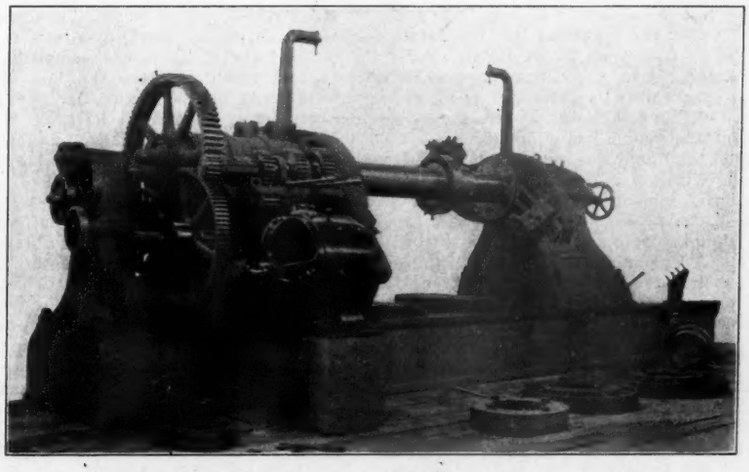


Fig. 3—The Niles-Bement-Pond Cylinder Boring Machine.

machine for turning up and grinding cutters. The cutters are made from flat steel.

The speed of the countershaft is 150 r.p.m. Tight and loose pulleys are 20 in. in diameter for a 5 in. belt. The weight of machine is about 6,500 lbs. The machine is furnished with countershaft, wrenches, three change gears, a short master bar, two boring bars with three cutters each, and two bushings and two pairs of gripping jaws. The floor space required for the machine is 9 ft. 6 in. x 7 ft.

The locomotive cylinder boring machine shown in Fig. 2 is made by the Newton Machine Tool Company, Philadelphia, Pa. The spindle of this machine is 8 in. in diameter, and is driven by a four-step cone, either through spur gearing as shown, or through a worm and worm wheel. The machine has a capacity for boring and facing both ends of cylinders up to 40 in. in diamtere and 50 in. long. The distance from the center of the boring bar to the bed is 36 in. The spindle is fed forward by a rack

and is arranged so as to be gripped in any position. The carriage, which is an auxiliary feature of these machines, is 36 in. wide x 5 ft. long.

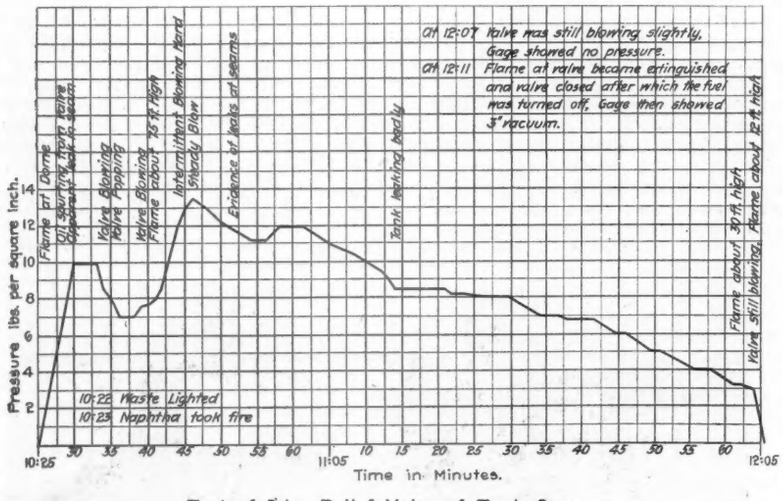
The cylinder boring machine shown in Fig. 3 is made by the Niles-Bement-Pond Company, New York. This machine will bore cylinders up to 37 in. in diameter and 60 in. long. The boring bar is 10 in. in diameter, and is provided with different sizes of interchangeable cutter heads which are adjustable along the bar by both hand and variable power feeds. The bar can be traversed out of the work by moving the tail stock by a ratchet. The speed change clutch-levers are placed convenient to the operator, and with the range of speeds in the motor enables a quick and close adjustment to the desired speed.

(To be continued.)

Test of a 5-in. Relief Valve on a Gasoline Tank.

The American Railway Association having decided at its last meeting that after Sept. 1, 1904, all tank cars of 6,000 gal. capacity or less, carrying volatile inflammable materials, must be equipped with one 5-in. safety valve of approved design, and those of over that capacity be equipped with two 5-in. safety valves. The committee of the M. C. B. Association made a further experiment in order to determine whether tank cars containing as much as 6,500 gals. should be recommended for acceptance with one 5-in. safety valve; the committee not being willing to make such a recommendation in the absence of actual tests. The test was made by the Union Tank Line Company at Lima, Ohio, July 27th, on one of its tank cars taken from service, equipped with a 5-in. safety valve and filled with stove-gasoline. It was a steel tank with a capacity of 6,491 gals. to the base of the dome, but as actually filled contained 6,509 gals., which partly filled the dome. The inside diameter of the tank was 76½ in., and the length between caulking edges 26 ft. ½ in. There were five barrel sheets $^{3}/_{16}$ in. thick, and the bottom sheet was ¼-in. thick. The dome sheet was $^{3}/_{16}$ in. thick; dome head, ¼-in. thick; and diameter of dome, 36 in. All rivets in the tank were ½-in. diameter. The longitudinal seams of the bottom sheet were double-riveted, with a distance between the rows of 2⅛ in. and 2⅛ in. spacing of rivets. All the other seams were single-riveted with 2-in. spacing of rivets, except dome head to dome sheet, in which the spacing was $1^{15}/_{16}$ in. The end heads were dished to 7½ in., with a 1⅜ in. radius in corner. The metal used was tank steel, except dome head, dome sheet, and end heads, which were soft flange steel.

The tank was erected in a field on three brick piers, the two outside piers being 12 in. thick and 16 ft. from center to center. The center pier was 24 in. by 24 in. in section, and was placed directly under the nozzle, for protection. The dome of the shell was 42 in. above grade. A basin 27 ft. long, 9 ft. wide and 8 in. deep was dug immediately under the tank, which had been charged with 66½ de. naphtha from a No. 4 agitator by means of a 2-in. pipe. A 1-in. pipe-line was run from the tank to a point about 700 ft. away, for the purpose of recording pressures. One end of this pipe entered the tank through the under nozzle and ended inside of the dome; this end was fitted with a 1-in. elbow. At the other end of the piping there were four gages, and the end of the pipe was plugged. The elevation of the gages was the same as the top of the tank dome. Fuel was supplied by a 1-in. pipe which ran to a point under the tank, and branched into four ½-in. pipes. The ½-in. pipes ended in ½-in. vertical nipples, which were about equally spaced so as to create a uniform blaze under the tank. At the start, the tank was full and the naphtha extended about 4 in. up into the dome. It contained 6,509 gals. at 76 deg. F., which equals, when corrected, about 60 deg. F. and 6,437 gals. The temperature at the top was 89 deg., at the center 71 deg., and at the bottom 68 deg.



Test of 5-in. Relief Valve of Tank Car.

The test began at 10.22 a.m., when the waste under the tank was lit; the gasoline fuel being turned on 25 sec. later. Within 2 min. and 35 sec., vapor from the contained liquid caught fire at a slight leak in the dome head. Within 5 min. and 35 sec., the expansion of the liquid had filled the tank and some of the liquid was escaping at the safety valve. Within 7 min. and 10 sec., the liquid overflowed violently; and within 8 min. and 55 sec. the safety valve opened and vapor and liquid gasoline were thrown out with violence. The subsequent history of the test is shown in the accompanying diagram, the fire being continued under the tank until complete dryness was reached.

The conditions, so far as the safety valve was concerned, were just such as would be met with in service when tank cars carrying naphtha become suddenly surrounded by fire. The safety valve operated perfectly, opening promptly at the desired pressure at which it was set, namely, 8 lbs., and the pressure never exceeded 13½ lbs. It was especially noticeable that the safety valve, which was in accordance with the design recommended to the Master Car Builders' Association, not only relieved the pressure but also discharged the flame upward in a compact column, the only flame coming down from the safety valve being that through the small vents which are placed around the seat in order to entrain and carry away water from rain, etc., which might otherwise gradually leak through the valve and injure certain oils.

From this test, the committee draws the following conclusions:

First, that tank cars of 6,500 gals. capacity and less, carrying naphtha, will be relieved without dangerous pressure if equipped with one 5-in. safety valve of the pattern already recommended to the Master Car Builders' Association.

Second, that the flame will be directed upwards, allowing wrecking forces to approach the tank to apply cooling streams of water; and,

Third, that the tank, although somewhat buckled and sprung in the rivets by the fire lasting nearly two hours, was apparently in no danger of explosion.

The Railway Signal Association.

The September meeting of this Association was held at the Great Northern Hotel, Chicago, on the 13th, President J. C. Mock in the chair. Mr. G. S. Pflasterer (N. C. & St. L.) was appointed Secretary pro tem. Ten new members were elected. Announcement was made that the Committee on Standards would offer at the October meeting a number of plans and a set of specifications covering material and workmanship of mechanical interlocking. Committee No. 4, on special circuits also promised a report for October.

Mr. Clausen (C., M. & St. P.): The committee on track and signal circuits for automatic block signals has held two meetings since the meeting in New York. On account of the breadth of the subject we decided to divide it into track circuits, operating circuits, controlling circuits and indicator circuits. For this year's work we have decided to treat track circuits, because the members of the Association are to some extent decided as to what they deem standard practice in track circuit work. On the other divisions much work would be necessary and the members have not so decided opinions. We intend to make some recommendations at the October meeting.

The committee on copper and iron wires for pole lines will report at the October meeting.

Mr. Peabody (C. & N. W.), chairman of the Committee on Definitions and Nomenclature, reported that this committee had held two meetings since the last regular meeting. At his suggestion the definitions adopted by the American Railway Association were discussed at length, and on motion of Mr. Dunham it was voted that the definitions of the American Railway Association, so far as they pertain to signaling, be adopted by the Railway Signal Association. There was some further informal discussion of definitions, and on motion of Mr. Dunham (I. C.) the meeting thanked the committee for the work it had done, and directed that the committee be continued.

Cost of Repair Parts.—The meeting then took up the question of agreeing on a schedule of uniform prices for signal materials bought by one railroad company from another, particularly parts for repairs and renewals at interlocking plants maintained jointly by two or more roads.

Mr. Dunham: Considerable misunder-

standing has occurred by reason of variable prices. The railroads do not have anything like uniform schedule prices for signal parts, and it would seem as though we might adopt arbitrary prices. All of the roads buy their fittings from one or two companies and the price lists of the companies are practically one.

Mr. Clausen: That is exactly the practice that has been in vogue between the roads northwest of Chicago for several years. Within the last two months the agreement has been made effective between nearly all the roads that I know of northwest of Chicago. The bills are made upon the basis of the net prices as shown by the Union Switch & Signal Company's last catalogue. The agreement is not a contract, simply correspondence between officers of the roads, the General Manager or the General Superintendent. It is a first class scheme and I would like to see all the roads adopt it. All the roads crossing the Milwaukee road have now adopted it.

Mr. Peabody: The same agreement is in effect with all the roads crossing the Northwestern.

Mr. Shaver (U. P.): Who absorbs the freight charge on this material?

Mr. Clausen: There is a clause that provides that 10 per cent. on the net charges of all material be added to the bill to cover the cost of handling and freight for all domestic lines.

Mr. Shaver: Some roads in the west have to pay pretty large freight bills on material bought in the east.

Mr. Dunham: As a general rule 10 per cent. charges added to the cost would cover freight and other charges. If the Union Pacific charges other roads cost price, how is it managed when material is bought at less than the schedule prices; does that affect all the material then in stock, or does it simply affect that particular lot? It seems to me if it affects only that particular shipment, it will result in a great deal of work for the accountants.

Mr. Shaver: If we buy an article at less than the usual price, the price at which we buy it is the price which is charged to the other road.

Mr. Peabody: How do you keep track of a large stock of material bought at less than the regular price and put into stock and scattered all over the system? We are maintaining 80 interlocking plants, and we buy large lots of material that go into stock at Chicago and then are scattered all over the system.

Mr. Shaver: We do not buy a very large stock at a time. Material is bought monthly, and it is used up, or supposed to be used up, in the month for which it is bought. There is some little trouble occasionally with items that have been lying in stock for some time, but this is not of much moment.

Mr. Ames (L. S. & M. S.): I do not think any system of accounting can be correct unless a suspense account is established. We buy, for instance, 1,000 lbs. of bare copper wire this month; we pay 13 cents a pound for it and we debit ourselves with $130; we may use a portion of that this month, and next month we may buy some which we may pay 13½ for; it is impracticable to say that the wire used on a definite job was that for which we paid 13 cents. I think there is a great deal of unnecessary haggling over prices. What is needed more than anything else is a uniform system of keeping our stock accounts, particularly a proper expense account. It is manifestly impossible to carry out the idea of using in any given month all material bought in that month, except on a very small road.

Mr. Peabody: Before we adopted our present method there was constant friction between the roads as to prices of material. The present plan does not settle absolutely the cost of all materials, but it settles such a large proportion that we have little difficulty with the remainder.

On motion of Mr. Shaver a committee was ordered appointed to investigate this matter with a view to ascertaining what other associations, like the Master Carbuilders' Association, are doing in this regard, and report at the next meeting; also to take up the question of what could be charged to maintenance and what to construction.

Distant signals in automatic block signaling on single track.—Mr. W. A. D. Short, chairman of committee, presented a report accompanied by diagrams showing four different arrangements of automatic home and distant signals on single track. The conclusion of the committee was that home signals should be staggered and that distant signals should be set back about 2,000 ft. from the home, or two-thirds the distance back to the end of the overlap track circuit. If set back 3,000 ft. (the end of overlap circuit) then opposing trains could both get clear distant indications simultaneously.

The report quoted the opinions of officers of the Cincinnati, New Orleans & Texas Pacific as to the value of automatic signals on a single track line, that road being equipped with them for 300 miles. All are sure that the capacity of the road is much greater than it was without the signals, but their estimates vary from 25 to 50 per cent.

Mr. Ames: It has been said that in single track automatic blocking the distant signal does not give a true indication. Does this mean that when the home signal is clear and distant signal at caution, that it does not always give an indication announcing that the first block home is clear, but the second block is occupied?

Mr. Short: The indication of the home is the same as on the double track, but the point is this, that two passing trains coming to a meeting point from opposite directions, the distant signal being located at the overlap point, might both come to the overlap at the same time and both get the clear distant signal. When they get to the home, the home would be against them; that is what is meant by not giving the true indication. But they have got to overrun the entire block of a mile and a half before they get together. We can obviate that to a great extent by locating the distant signal either outside the overlap, or inside the overlap, but that means about $100 more of signaling; and the contingency happens so rarely that it will not compensate for putting it in. . . . In some conditions we use the overlap at each end, in others we use it only once. We use the overlap generally at both ends for the blocks between stations, and at a station block only on one end; it depends on the local conditions. On a very steep grade we overlap everything.

This discussion being closed, the members listened to an interesting paper by Dr. Nelson Miles Black on some tests which he had made with colored glasses (roundels) from an ophthalmologist's standpoint; and on motion of Mr. Peabody, a vote of thanks was extended to Dr. Black, and the paper was ordered printed in the annual proceedings.

Mr. Ames: We use a red light for an open derail; and a man who goes by that light 50 ft. goes on to the ground. We also use the same on train order signals, where it is not an absolute stop signal. There are roads where the train order signal requires an absolute stop before reaching it, but not many; and with heavy freights you cannot afford to require it.

Mr. Clausen: Inasmuch as the American Railway Association has put the stamp of approval upon the custom of using one signal post for both directions on double track you must allow your trains to run by. But it is not right to have a red light at one place mean stop, absolutely, and at another to stop permissively. A red light should mean "stop" under all conditions.

Mr. Short: For 19 orders we display a green light instead of red light in the train order signal.

Mr. Ames: We are going to display on our train order signal masts 18 in. to 20 in. below the regular light, a fixed purple light that cannot be seen more than about 1,200 to 1,500 ft. away.

Mr. Short: The green light we display is a hand signal, displayed by a man on the ground.

Meeting of Committee on Standard Specifications.

A meeting of Committee A of the American Society for Testing Materials on Standard Specifications for Iron and Steel, was held on September 17 at the house of the American Society of Civil Engineers, for the purpose of meeting Mr. Leslie S. Robertson, Secretary of the Engineering Standards Committee of Great Britain; Dr. Charles B. Dudley, President of the American Society for Testing Materials, occupied the chair. There were present at the meeting, as guests of the committee, a number of chairmen of committees of other societies concerned with work of a similar nature. It appeared that the committee was first formed at the instigation of the Council of the Institution of Civil Engineers, to consider the advisability of standardizing rolled sections. The work of the committee gradually grew in scope and importance, and various new subjects were added from time to time.

Mr. Robertson explained the constitution of the committees, and the representative nature of their membership. The committees are constituted so as to embody in them, representatives of all the various interests affected, and where possible, this representation has been secured by official nomination and not by private selection. Various scientific bodies and trade associations have cooperated with the committee. These specifications have been carefully discussed by the engineer and manufacturer meeting around the table of the institution, where any conflicting interests have been, as far as possible, amicably harmonized.

The committee has published several reports, one of the most important being that on "Standard Test Pieces." The test pieces decided upon by the committee appear to go a long way toward solving the difficulties surrounding this much debated question. The test pieces were arrived at after the most careful investigation by several of the committees, and after exhaustive experiments by Professor Unwin and others. Various speakers expressed their approval of these standard test pieces and their conviction that the general adoption of them in this country would mark a distinct step forward. It was the sense of the meeting that substitution of these standards for those now prevailing in this country was desirable. It appears from Mr. Robertson's remarks that the standards committee has a large amount of valuable work in hand, and as the committee is supported by the British Government and the five leading technical societies in Great Britain, the results of their work will be awaited with great interest by the engineering profession not only in Great Britain but also in this country.

It will be seen from the foregoing that the British Engineering Standards Committee is proceeding on lines quite similar to those followed by the American Society for Testing Materials. Both recognize the desirabil-

ity of according representation on their committees to all parties in interest, including the manufacturers. The work is distributed among numerous sub-committees, whose reports are submitted to the parent committee for revision and adoption.

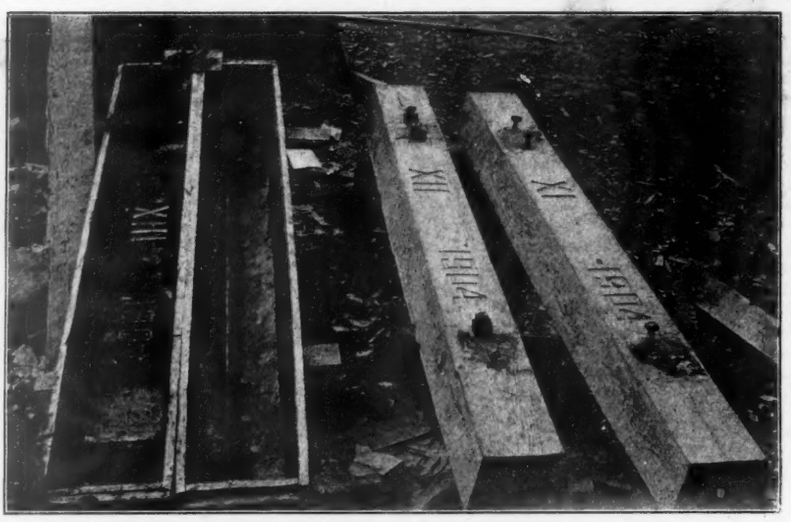
Mr. Robertson is expected to meet members of several of the committees of the American Railway Engineering and Maintenance of Way Association, engaged on similar subjects at a special meeting in Chicago on September 29th. The discussion of the general subject of standardization of methods of testing and of specifications governing the materials of construction will be continued at the International Engineering Congress in St. Louis, October 3 to 8.

Foreign Railroad Notes.

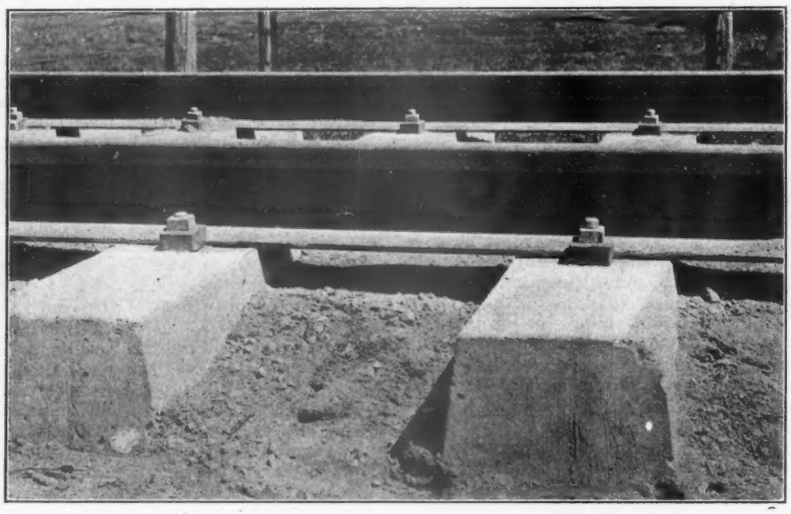
In 1887 the French Minister of Public Works notified the railroad companies that at least one water closet should be provided on every passenger train which run more than two hours without a stop of at least 10 minutes. In 1890 another circular declared that while it was not insisted that such provision should be made immediately in all cases, the gradual fulfilment of the requirement must be borne in mind. Now, 17 years from the issue of the first circular, the Ministry says that the time allowed has not been properly availed of, and that France is behind the age in this matter. Within a year every passenger train running more than two hours without a 10-minute stop really must have at least one water-closet, and within three years there must be one for every class. Seventeen years really does seem a good while to wait.

The opening of the first division, 280 miles long, of the pilgrim railroad, from Damascus to Mecca, was to be celebrated Aug. 31, the anniversary of the Sultan's accession to the throne.

It has been very dry the past summer in Germany and further south, and the forage crops have suffered so that they were insufficient to winter all the live stock. The natural consequence feared was that cattle, etc., would be rushed to market, and there would be an insufficient amount of it for some time to come. To prevent this, which was regarded as a threatening national calamity, the freight rates on forage to the districts which suffered from drouth were reduced greatly (one-half in some countries) in Germany, Austria and Hungary, by the State Railroads, usually followed by the private railroads, which latter are important only in Austria. Another consequence of the drouth has been low water in the rivers, so low that navigation has been suspended in some of them which ordinarily have very important traffic in coarse freights. In view of this, the German State Railroads have been asked to reduce the freight rates on such shipments as usually go by river to the level of the usual river rates. This the authorities have declined to do. The reduction on forage, they say, was to avoid a national calamity; and no such disaster is threatened by the turning of river freights to the railroads.



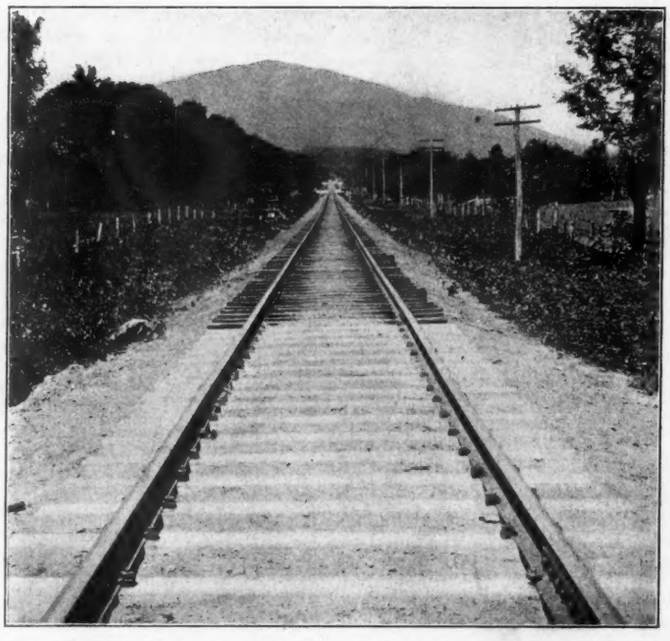
Reinforced Concrete Ties and Mold.



Reinforced Concrete Ties in Track Showing Fastening Clips.

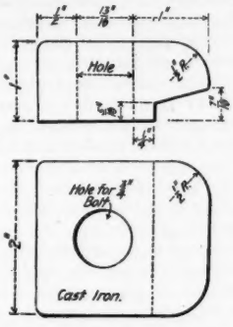
Concrete Cross-Ties on the Ulster & Delaware.

A number of the reinforced concrete cross-ties shown in the accompanying illustrations have been put in the track on the Ulster & Delaware for experimental purposes within the last year and the results so far have been very satisfactory. As will be seen from the drawing, the tie consists of a solid prism

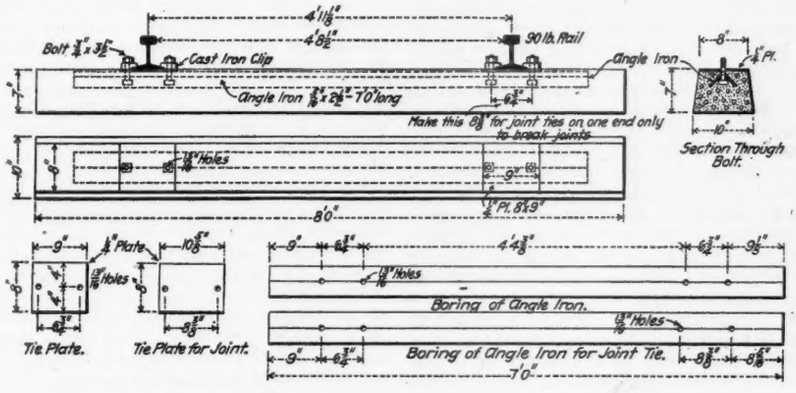


Reinforced Concrete Ties in Track on the Ulster & Delaware.

of concrete, 8 ft. long by 7 in. thick, and battered from 10 in. wide at the base to 8 in. at the top, moulded in wooden forms and reinforced with a piece of angle iron placed with the corner about ¼ in. below the top surface. Tie plates ¼ in. set in flush with the top of the tie form a seat for the rail which is held by two ¾-in. x 3½-in. square-head bolts passing up through the angle iron and having clips fitting over the flange of the rail. The concrete was mixed rather wet and shovel-tamped into the forms. It was found that no facing was necessary, the concrete taking a perfect impression of the form even to the grain of the wood and giving the



Rail Clip for Concrete Tie.



Reinforced Concrete Cross-Tie on the Ulster & Delaware.

tie the appearance shown in one of the illustrations which is from a photograph. A mixture of one part of Atlas Portland cement, two parts of coarse sharp sand and four parts of crushed limestone which would pass through a ¾-in. ring was used and the reinforcement was old angle iron picked up around the shop which varied from ¼-in. x 2-in. by 6-ft. pieces to ⅜-in. x 3½-in. x 7-ft. 6-in. pieces. The cost of a tie is 42 cents exclusive of the cost of the reinforcement, and the weight is about 450 lbs. The reinforcing angles are drilled for the fastening bolts before being placed in the forms and two spacings for the holes are necessary, one for the joint ties and one for intermediate ties. The heads of the bolts fit up between the legs of the angle and are prevented from turning when the nuts are turned up and as the tie plate rests directly on the corner of the angle, there is no crushing down of the concrete when the nuts are tightened.

One of the first of these ties which was made was put in the track in May, 1903, and after more than a year's time shows no signs of failure whatever, despite the severity of the past winter. The nuts and clips holding the rail to the tie are as tight now as when first put in, and this without having been touched during the entire time. It will be seen that no provision has been made for shimming these ties and their heavy weight is also another disadvantage, making them cumbersome to handle on and off cars and in the track, but if they prove to have good lasting qualities these objections will be more than offset.

Railroad Station Improvements.*

Notwithstanding that improvements to railroad station grounds still fall short of what they might be, or certainly will be, the general improvement in the last ten years has been marvelous. This improvement is not confined to a few roads or to any one section, but is almost universal. A higher grade of architecture and more attention to sanitary regulations, as well as to the parks surrounding stations and to the right of way can be observed on nearly every passenger road in the country. They vary in degree, of course, owing somewhat to the comparative taste and culture of the officials in charge. Speaking of that phase of the subject, I have noticed that in nearly all cases where the landscape work is in charge of the engineering department, there is not the same advancement as where it is in charge of the general manager's department. This is not strange, as engineers are exceedingly practical as a class and work on the straight line idea. There are notable exceptions, as the letters included in this report prove, but we must speak in generalities.

One looks for more artistic appreciation and development in the East and Middle West, but the Far West and the North compare favorably. For instance, the Duluth & South Shore Railroad, traversing the upper peninsula of Michigan between Duluth and Sault Ste. Marie, has lately built three depots, which embody all that is most pleasing architecturally and artistically. The Grand Rapids and Indiana, which also runs into northern Michigan, has lately erected three magnificent depots, whose surrounding grounds have also been laid out by a landscape architect, with successful results. In many instances the square plat of ground fenced off in graveyard style, with the geranium and canna bed, is in evidence in the West, but it is also to be found in the East. I find, as a rule, that this is because no one has pointed out the advantage of hardy shrub planting. In California I found the greatest trouble to be the total disregard of color harmony in the arrangement of flowers, and the tendency to overdo. Nature is so prodigal there that it is hard to realize that little should be done, and that with care. In regard to the paint question (a very important one, by the way) California is far ahead of the East. Subdued colors blended with perfect harmony is the rule. Some of our roads with their orange and red combinations, which, even as you flash by on the "Limited," give you a nervous shock, might learn a lesson by visiting some of the Southern Pacific stations. The Chicago & North Western and the Chicago, Milwaukee & St. Paul are roads which we of the West are justly proud of. All of their stations of recent years are artistic, sanitary and convenient. The surroundings are made as artistic as money and the skill of the landscape architect can make them without sacrificing needed space for the requirements of the business. The idea is to combine utility and beauty. You will notice that I put utility first. It has been conclusively proven that in the hands of persons skilled in the work this can be done without any detriment to business.

The Chicago & North Western keeps a gardener and force of men constantly caring for the grounds and shrubbery already planted. The Chicago, Milwaukee & St. Paul in the last two and one-half years has parked and planted, under the direction of a landscape architect employed by the year, 275 stations, but as the system embraces 7,000 miles there is much yet to be done. They are going a little slowly this year, but the work is to be continuous. The Chicago, Rock Island & Pacific puts up no cheap depots; everything that it does is first class and it has made some pretty parks. Most of the officials are very much in favor of the work, but retrenchment has caused a temporary suspension of it. The Chicago, Burlington & Quincy is thoroughly alive to the advantages of station ground improvements and began the work last fall in a small way. The Chicago & Alton has made the most radical move and is entitled to more credit than most roads for its courage in starting improvements at a time when all other roads were retrenching. The thoroughness with which its officers have undertaken the work of parking their station grounds between Chicago and St. Louis, painting their depots in good taste, regrouping their secondary buildings, putting in new brick platforms with curved corners, employing skilled labor and then trusting to their judgment and taste, entitles them to the approval of the American Park and Outdoor Art Association.

Following are extracts from some of the replies received to a circular letter to officers of 125 railroads. This letter asked what these roads had done or contemplated doing in the near future to improve their station surroundings, and requested an expression of opinion as to the value and benefit of such work.

Chicago, Milwaukee & St. Paul.—"In the matter of parking and beautifying our station grounds, we have undertaken considerable work of this nature on different divisions of our systsm and are much gratified with the results. We have not only been able to make beautiful parks of what was formerly unsightly places, at small expense, but find that it is an education to our employees to be neat and systematic and avoid the expense of frequent cleaning up of our depot grounds, so that in addition to being a 'joy forever' we also find that it is economy."—W. J. Underwood, Assistant General Manager.

Lake Shore & Michigan Southern and New York Central.—"It is our practice on the Lake Shore and New York Central roads to have laid out each year by an experienced landscape gardener a number of station grounds, which are planted and kept in order from year to year. The planting is done by gardeners, and the foliage is kept in order by section men, except where the amount of work to be done requires the entire time of gardeners. In a general way we endeavor to develop nice shade trees adjacent to the

*Extracts from a report presented to the St. Louis convention of the American Park and Outdoor Art Association, by Mrs. A. E. McCrea, Chairman of the Railroad Improvement Committee.

driveways, and in the station background, generous lawns and flower beds, placed for the best effect. We feel that a moderate amount of this work is very desirable as it adds much to the attractiveness of our station grounds and to the general appearance of our right-of-way."—W. C. Brown, Vice-President.

Pere Marquette.—"We have done but little in regard to improving station grounds, and that only at more important points. I should like very much to see all of our station grounds improved and can only offer in explanation of the lack of attention, the fact that it costs to get the improvements started and to maintain them. It is useless to go to the expense in the first instance unless they will be preserved. Personally, I believe the ornamenting of the station surroundings of great value. The presence of order and neatness along properly has its influence upon employees, which in my judgment is of even greater value to the company than the revenue which may be derived on account of the same. There is no doubt, persons in traveling seek attractive routes."—F. H. Alfred, Chief Engineer.

Union Pacific.—"For some years past we have been beautifying our station grounds by sodding and by planting trees and trailing vines, and, in some places, where practicable, by planting flowers. In the deserts of Wyoming some of our parks are very fine and quite a contrast to the surrounding country through which the traveler passes. This is notably so at Cheyenne. We keep adding to the number of our parks each year and are very much in sympathy with this kind of work within the limits we are allowed."—J. B. Berry, Chief Engineer.

Norfolk & Western.—"Particular attention is given to the cleanness of all station grounds on the Norfolk & Western, and at important points they are beautified by well-kept lawns and shrubbery, omitting flower beds. I think proper efforts upon the part of your association should attain beneficial results for the railroad companies as well as the public."—L. E. Johnson, President.

Central Railroad of New Jersey.—"We maintain a park department with a force in charge whose duty it is to set out plants, shrubs and trees, and keep the lawns about stations in first class order. We set out about 15,000 plants every year besides hardy shrubs and trees. The class of travel from our suburban district is of the highest order, and we believe there is a distinct benefit to our company in keeping up the appearance of our parks and station grounds."—W. G. Besler, Vice-President and General Manager.

Illinois Central.—"Several years ago the Illinois Central adopted a policy of gradual improvement of its station grounds and right-of-way. We erected a greenhouse where flowers and plants are grown for setting out at stations along the line in the spring of each year, and for supplying ferns and flowers for our dining cars. So far, we have only undertaken the improvement of the grounds at our most important stations where lawns are sodded and flowers and shrubs are planted. At other stations, however, we have sodded around the buildings, and the agents are particularly instructed to keep the premises in as neat and clean a condition as possible. A gradual improvement is being carried on in this way, and we expect to continue the work in line with this policy, believing that our passengers will appreciate our efforts in this direction and that they, as well as ourselves, will be benefited thereby."—J. F. Wallace, General Manager.

Grand Trunk.—"While we have done something within the past few years in the way of beautifying the surroundings of our stations by lawns, gardens, etc., we have had so much work of more vital importance that the matter has not received systematic attention. We have confined our efforts chiefly toward beautifying station grounds where we have erected new buildings, and have refrained from expending money in this connection at many of the older stations where, in the near future, we hope to be in position to make improvements. Undoubtedly we are of the opinion that railroad companies are amply repaid for reasonable expenditure in beautifying the surroundings of their stations."—F. H. McGuigan, General Manager.

Boston & Maine.—"We first considered the matter of station ground decoration in the early '80's, and on Jan. 31, 1881, the Board of Directors authorized a prize competition for the best decorated station lawn, allowing each agent $10 for the purchase of budding plants. The system thus inaugurated has continued to the present day and competition has been stimulated and interest has become more widespread by the increased prize money. Within the past five years the idea has gained strength that hardy perennials are much more satisfactory than budding plants alone, making more of an ornamentation in early and late season, and grounds of many stations have been laid out accordingly."—C. E. Lee, Assistant General Manager.

Canadian Pacific.—"The floral department of the Canadian Pacific was established six years ago. Our object has been to induce agents, section foremen and other employees to beautify the stations and houses, which are practically their homes. In the springtime, I supply seeds and plants, and in the fall, bulbs for outdoor and indoor cultivation, everything being supplied gratis. The work is meeting with great success."—N. Stewart Dunlop, Floral Department.

Chicago & North Western.—"There are 1,700 stations on our line with a tributary population of 7,600,000, and the importance of a policy by means of which the traveler on alighting from the train finds himself in the midst of a pleasing landscape of flowers, shrubbery and well-kept lawns, is one the full value of which can hardly be computed. This value is felt not only by the traveler, but in each community so fortunate as to be thus favored. The influence of an example of this kind is one that extends into the civic life of the community very rapidly, and the standard for breathing places, parks and boulevards, and indirectly for improved streets and public buildings in western towns, is being rapidly raised to a plane that is nowhere excelled, largely as the result, it may be said, of the railway's early example. No feature of our beautiful suburbs is more pleasing to the eye than the attractive station grounds which mark the traveler's entrance to the town. Careful attention and liberal expenditure is shown in the pleasing architecture of the station buildings, so that, taken as a whole, there is probably no series of suburban stations in the United States that attain a higher average from the standpoint of beauty.

"While the most complete luxury and comfort is possible on the modern railroad train, yet this attention to outside surroundings has also a most desirable influence and adds to the temporary home of the traveler that sense of attractiveness that makes the American railroad so notable. But the most important feature of this systematic campaign for the beautifying of what is one of the most generally used and widely noticed places in the community—the railroad station—is the educational effect it has had upon each community whereby the universal beautifying of homes and streets has been rapidly brought nearer a fruition that is ideal.

"This work of beautifying station grounds and right-of-way is a part of the permanent policy of this company and, as such, its bearing upon the community with which the road is so closely connected geographically and from the traffic standpoint is, it seems to me, the most pleasing feature of the work that can be done by railroad companies or other transportation lines that keep in close touch with the requirements of the people they serve."—W. B. Kniskern, Passenger Traffic Manager.

Preservative Coatings for Iron and Steel.

At the Atlantic City meeting of the American Society for Testing Materials, the Committee on Preservative Coatings for Iron and Steel presented an interesting report. The members of the committee had been asked to submit their views as to the best methods of testing preservative coatings. An abstract of some of the individual reports follows. Dr. C. B. Dudley, chemist of the Pennsylvania, said: "We think that the test of service is the ultimate test which will prove whether any protective coating is or is not valuable. But experiments with protective coatings in actual service are extremely difficult to make, and are subject to many vicissitudes. Moreover, they require a long period of time before a conclusion can be reached. If the structure is a permanent one, that is, does not move, the results only apply to the location under which the test is made. If the structure is a movable one, such, for example, as a steel car, there are very serious difficulties introduced into the test, due to the almost impossibility of watching the car while it is in service, and to the danger of losing track of it before the test is completed.

"In view of this difficulty, exposure tests on smaller samples have been proposed. Coat, for example, a number of pieces of metal with the various protective coatings which it is desired to test, and expose them for a period of time. Valuable information can be obtained from exposure tests, but these tests have at least four objections to them: (1) The samples are usually small, and small samples do not quite afford the same opportunity to get the proper amount of coating on them, as if the samples were larger. Moreover, the coating is usually done under more favorable conditions than apply in actual service. And there seems to be a fairly well grounded belief that panel tests, as they are called, are not sufficiently like the actual conditions of service to warrant final conclusions. (2) During exposure tests there is always the uncertainty as to whether something will not happen to the test samples, such, for example, as the record being lost, or the samples being injured in some way, or somebody not conversant with the conditions interfering with them. (3) Exposure tests take a long time, and this long time is not infrequently accompanied with changes in the personnel of those having charge of the test, with a forgetfulness as to exactly what was done with the various samples. (4) Probably, however, the most valid criticism of exposure tests on panels or small samples is that the conditions are not those of actual service. The samples are located at one place with a certain exposure. This exposure is not the exposure which structures actually get. Furthermore, the small panels are not under strain, which is characteristic of almost every metal structure in actual service, and whatever deterioration may be due to strains does not appear in the exposure tests.

"We have spent quite a little time trying to devise a test which will determine whether water permeates paints or other materials de-

signed to be used as protective coatings. Our first thought was to put on glass or other transparent non-absorbent surface, some substance which would change color when water gets to it, and after the gum holding the material had been dried out thoroughly, coat it with paint or other protective coating, and then put the painted object into water. Experiments with anhydrous sulphate of copper and other materials which change color when water gets to them, proved not very satisfactory. Apparently during the drying of paints of which linseed oil is a constituent, water is formed in the layer itself, due to the chemical action. Our experiments showed some blueing of the anhydrous sulphate of copper, even before the specimen had been put in water. The most successful results which we have obtained have been by using a water solution of dextrine. We have made a number of such tests, and have found that almost no paint containing linseed oil as a constituent, is impervious to water.

"There are still some uncertainties in the tests. For example, linseed oil paint does not reach its final state of oxidation, or the change which we call drying, for quite a period of time. We have not yet made any tests, where the paint layer was allowed to harden for more than ten days or two weeks. It is possible that a longer time before the paint was tested would prove advantageous, and there is considerable indication that such would be the case. There are indications still further that the presence of pigment very greatly helps the linseed oil to resist the penetration of water, and also a good deal of evidence that the fineness of the pigment is a most important element in the water resistance of the layer. Furthermore, the nature of the pigment seems to be an element likewise in the problem.

"The query may arise, why is it that a layer of paint made with linseed oil should allow water to get through it?

"It seems almost incredible that an oily substance spread out in a thin layer should not so completely repel water that there would be no permeation of the layer. But it must be remembered that dried linseed oil is no longer an oil. The mass of dried linseed oil, if we may trust Mulder's researches, is a tough, leathery sort of material, which does not leave an oily stain when touched, and which is changed chemically from being an oil into a material which Mulder calls 'linoxyn.' During the drying or the change of the oil to linoxyn, there seems little doubt but that oxygen is absorbed and carbonic acid at least is given off; but if carbonic acid is given off as fast as it is formed, it must escape, and it must escape not only from the outer surface of the layer of paint, but also deeper down in the layer, and it is believed that this escape of the carbonic acid, it being a gas, leaves apertures in the dried layer, through which apertures the water passes when the material is tested, as has already been described. Whatever the philosophic explanation of the porosity of the layer of dried linseed oil paint may be, if our experiments are to be trusted, this porosity is a universal characteristic at least of the layer two weeks old.

"We cannot help feeling that our experiments seem to indicate that it is going to be difficult, not to say impossible, to make a perfectly water-resistant productive coating out of a material which consists largely of linseed oil. Substances brought forward as protective coatings which dry by evaporation of the solvent, seem to offer much more prospect of success."

MALCOLM MCNAUGHTON (JOSEPH DIXON CRUCIBLE COMPANY):—In outlining a test scheme for protective paints, the following points are to be considered: Cost, application, drying, adhesion, elasticity, porosity, resistance to mechanical injury, permanency.

1. *Cost.* This point may or may not be included in a scheme for testing paints. It is properly included when the test is made by the person who is directly interested in the economic side of the question, and may properly be left out by him who has to determine only the value of the paint as a protective coating.

2. *Application.* This bears on the facility with which the coat may be applied, whether it may be properly applied over other and different coatings, whether it may be applied at all ordinary temperatures, and whether or not any special treatment of the surfaces is required. Knowledge on these points is only to be had by actual trials.

3. *Drying.* Continued observation during an actual trial will give all the information necessary on this point. But it is necessary that observations be made up to the time that the paints are actually hard and dry, because it may happen that one paint may begin to dry on the outside more rapidly than another which may finally pass it and become dry first.

4. *Adhesion.* This is a most important point, it being self-evident that any paint to protect must stay in place. Relative adhesion, when decidedly unlike, may be detected when the paints are fresh by simply peeling off at the point of a chisel. But adhesion must persist throughout the life of the paint, so that it becomes necessary to test the paint films after having given them somewhat the effect of age. Probably as fair a way as any, to secure this effect, is to subject plates of painted iron or tin to repeated alternations of heat and moisture. Tests for adhesion should be made before any others, as a paint coat which lacks this quality, when new, should be immediately condemned.

5. *Elasticity.* This quality enables a paint film to accommodate itself to its base during changes as a result of variation of temperature or form. When we consider the great difference in the coefficient of expansion between the metals and oils, we see that, unless there is a certain degree of elasticity, rupture of the paint film must occur. Films of paint, detached from their support, are best for determining relative elasticity. The simple test of bending is enough to give information where the difference in elasticity is enough to be of importance.

6. *Porosity.* Since iron does not rust except in the presence of moisture, it is important that the protecting film of paint should be non-porous in the highest degree, without the sacrifice of other desirable qualities. This is a test which should be applied when the paint is in its most perfect condition as a protecting film. It is not correct to test by repeated evaporations of water in a painted dish, because the deterioration of the paint by these repeated evaporations is also involved. The method of using postage stamps painted on glass, covered with a couple of coats of paint, and when dry, immersed in water, seems good. This may not be exactly correct in its technical aspect, but should give approximately correct results when made for comparative purposes.

7. *Resistance to Mechanical Injury.* Tests to determine this need be made only in special instances where conditions are such that protective coverings may fail from this course. Where such a test is advisable, it is easily made by allowing a stream of sharp sand to flow over the painted surfaces from a hopper, the sand being returned from time to time. The test is easily made more or less severe by varying the height of fall and angle at which the stream strikes the plate.

8. *Permanency.* Protective coatings may be assured as quickly reaching their condition of greatest efficiency. We may consider that when a paint has become what we call dry, it has reached that condition. From that point of greatest efficiency there is a gradual, more or less rapid progression toward ultimate failure. The paint in which this progression is slowest is to be taken as the most permanent. The value of this function must be determined entirely separate from the determinations of the other qualities, and the test should be so conducted as to bring about a slow change, rather than to destroy. The test should be made with especial reference to the conditions under which the paint is to be used. The test should be made with paint films which have been detached from their support. They should be of sufficient thickness, not less than two coats, and probably three would be better. They may be prepared on thin zinc plates, the zinc being dissolved off by dilute sulphuric acid, or they may be prepared on cardboard covered with a paste of dextrine. When dry the whole is immersed in water and the support soaked until it may be separated from the film. Films of various paints to be compared are subjected to the same set of conditions and their relative action observed.

It is much easier to detect changes in films separated in this way than when attached to their supports.

The foregoing tests, while simple, and probably capable of much improvement, are sufficient to give considerable information when made carefully for competitive purposes, yet at the same time they do not give exact values. Under any one test in question, it will be easy to show that one paint is better than another, but not so easy to show just how much better. Judgment in this matter can only come with experience. It is to be supposed that any test of paints is for the purpose of selecting the one most suitable for some set of actual conditions, and that these actual conditions indicate the relative importance of the tests to be made.

The rate of drying, resistance to mechanical injury, porosity, adhesion, etc., may each in turn be the feature of greatest importance. It would certainly be an absurdity to lay much stress on relative porosity of a coating which is to be applied to bridges in Arizona, or to pay much attention to the matter of elasticity in a paint for ironwork in a damp subcellar.

Unfortunately, no paint has yet been discovered which possesses pre-eminently all the qualities needed for iron and steel protection, so it becomes necessary for us, if we hope to get best results, to determine in some way what particular product is at least as good as any other for the case in hand. It seems to be entirely within the scope of this committee, in addition to suggesting methods of making tests, to suggest also a scheme for combining the values obtained by such tests, into an equation, the solution of which will give relative values in particular cases. For instance, the efficiency of a coating may be represented by an equation where one side consists of the sum of the values for the various functions previously determined by experiment, each multiplied by a factor which represents its particular importance in any specified case. Thus in different cases we may take the factors as follows:

Cost 1	Cost 1	Cost 1
Application ..1	Application ...1	Application ... 1
Drying 4	Drying 1	Drying 1
Adhesion 2	Adhesion 1	Adhesion 1
Elasticity 1	Elasticity 1	Elasticity 1
Porosity 2	Porosity 1	Porosity 10
Resistance to mechanical injury 3	Resistance to mechanical injury 1	Resistance to mechanical injury 1
Permanency ..2	Permanency ..6	Permanency .. 1

The first set might be used in testing

paints for steel cars, the second for highway bridges, and the third for ironwork in locations subjected to steam and acid vapors. Such a scheme will have its limitations and variations due to the personal equation of the man operating it, but eventually there would come a certain degree of standardization. These suggestions are presented with the idea of showing the advisability of a scheme which will necessitate the consideration of all the points involved.

With regard to time tests, not much need be said except that the pieces to be exposed should have at least 2 sq. ft. of area on each side, and should have two coats, the second applied only when the first is dry. The second coat should be dry before exposure occurs, and the exposure should represent the average conditions it is desired to protect against. The test piece should consist of vertical and horizontal parts, the latter to serve as a resting place for water, cinders, dust, etc. Where such pieces have been examined from time to time, such places should be covered by paint to prevent extension of corrosion from the damaged surfaces. This patching-up paint should be of a different color than the paint which is being tested, to avoid any confusion.

S. B. NEWBERRY:—It is difficult for me to suggest a scheme for testing Portland cement as a protective coating for iron and steel, since the methods of using it for this purpose have not yet been developed. However, I think there is no reason why cement should not be submitted to the same tests as other paints, so far as these are found to be applicable. Cement coatings should, however, be kept in *moist air* at least 24 hrs. after being applied. Whether this will prove practicable on a working scale must be determined by experience.

For these experiments cement in extremely fine state of division will be necessary. We have facilities for furnishing such cement, prepared from our regular product by air separation, and could ship a barrel or so for experiment at any time. The cement should be mixed with water to about the consistency of ordinary oil paint, and kept thoroughly stirred while being applied.

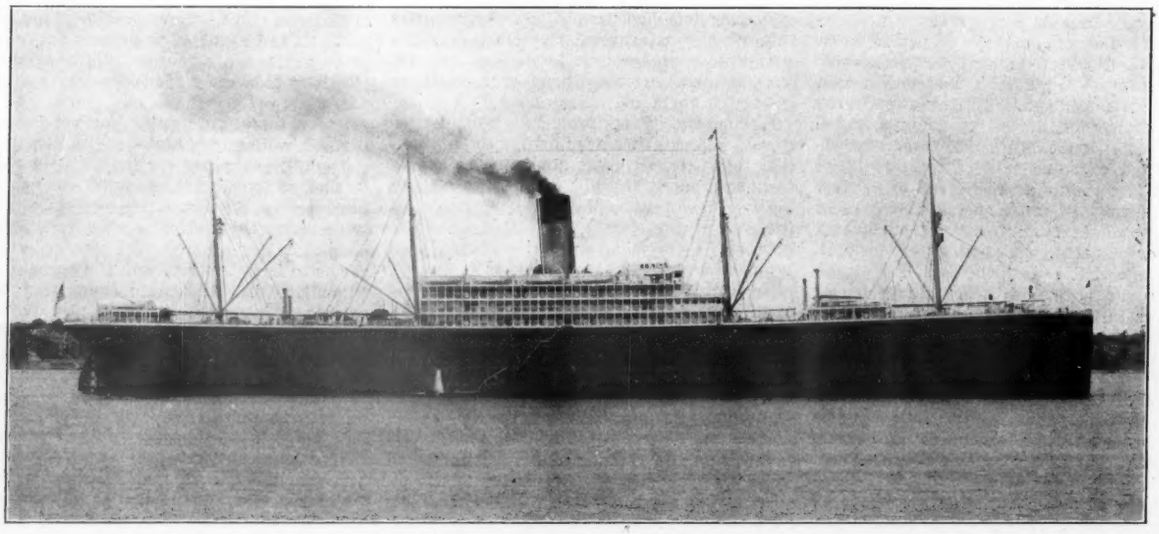
I would suggest also experiments with cement with the addition of calcium chloride to the amount of 5 and 10 per cent. of the weight of the cement, having found by experiment that this aids greatly in producing a thorough set of the cement before drying takes place.

W. A. POLK (PATTERSON-SARGENT CO.):—The preservation of steel cars is a question requiring careful study. The preparation of the cars for painting is obviously of prime importance. An experience will serve to show to what extent this point should be considered. In making an observation recently the writer noticed that the plates of a new steel car were covered with oil which had been used on the rivet holes. This oil had spread over the surface of the car in large spots. The writer instructed the painters to remove the grease entirely from the surface, but before these instructions had been given the men had painted a part of the car without removing the grease. On the following day, after the entire car had been painted, it was found that the coating was entirely dry except on the first section, from which the grease had not been removed. The paint on this section was perfectly wet; that is to say, it was in the same condition as when first applied. In order to expedite the completion of the car, the men were instructed to wipe off both the wet paint and the grease which had caused the trouble. Where the grease remained, both it and the paint could be wiped off, but from contiguous spots where no grease existed the paint was hard and clung so firmly to the steel surface that it was removed with difficulty by the use of a knife.

Another matter of importance in this connection is the removal of mill scale and rust. The painting of steel cars offers an opportunity of painting under precisely the same conditions if each car be cleaned alike. Naturally the conditions of exposure vary to some extent, but a record could be kept of certain cars and by inspection from time to time instructive results might be obtained. Cars might be chosen which remain continually on the same railroad, for example, cars carrying coal from the mines to tidewater.

The Steamship Minnesota.

The accompanying illustration shows the twin-screw steamship Minnesota, built by the Eastern Shipbuilding Company, New London, Connecticut. The Minnesota is the largest freighter ever built in America, and the fourth largest steamship in the world. She was built for the Pacific trade and is to run in connection with the Great Northern Railroad, which has its Pacific terminal at Seattle. The principal dimensions of the Minnesota are: Length, 630 ft.; breadth, 73 ft. 6 in.; molded depth, 56 ft.; maximum draft, 36 ft. 6 in., or the same as that of the White Star steamship Baltic, which is the largest steamship afloat, and which was described in the *Railroad Gazette*, July 15, 1904. The total space available for cargo and coal is 1,072,000 cu. ft., and her dead weight carrying capacity is between 20,000 and 25,000 tons. With a draft of 36½ ft. her displacement would be 37,000 tons, and with a draft of 33 ft. her displacement would be about 33,000 tons. She is built of steel throughout and is divided transversely into 13 water-tight compartments, and has a longitudinal bulk-head from keel to main deck, which is watertight in both engine and boiler spaces, making in all 15 water-tight compartments above the double bottom. The double bottom is 6 ft. deep and extends from end to end. It is divided into 30 separate watertight compartments in which 3,966 tons of water ballast can be stored. There are five steel decks extending the full length of the ship, and there are four more steel decks in the passenger spaces, making nine decks in all. From the upper navigation bridge to the keel is a distance of about 89 ft. There are ample facilities provided for rapid loading and unloading, there being 34 cargo booms in all. One of these booms has a lifting capacity of about 40 tons, and one of the hatches is long enough to allow a complete locomotive to be lowered into the hold. The steam is generated by 16 Niclausse water tube boilers. These have a heating surface of 40,615 sq. ft. and a grate surface of 1,081 sq. ft. The steam pressure is 250 lbs. The funnel is elliptical, measuring 19 ft. fore and aft, and 16 ft. 3 in. transversely, and its top is 135 ft. above the keel of the ship. Induced draft is used and automatic stokers and ash conveyors will be installed if results of the tests which are now being made with them on her sister ship, the Dakota, prove successful. The total coal bunker capacity is about 6,000 tons, 2,000 tons being stored in a reserve bunker. The permanent coal bunkers are over the boilers and deliver coal through chutes to the firing platform. The main engines are of the triple expansion type with cylinders 29 in., 51 in. and 89 in. in diameter by 57 in. stroke, and develop from 10,000 to 12,000 h.p. at 78 revolutions per min. The twin screw propellers are each 20 ft. in diameter. The average speed of the vessel is about 15 knots per hour.



The Steamship Minnesota.*

*Photo courtesy *Scientific American*.

GENERAL NEWS SECTION

THE SCRAP HEAP.

According to a Knoxville paper, both the Southern and the Louisville & Nashville railroads now refuse to haul circus trains.

The railroads of Philadelphia are considering the question of charging demurrage on cars loaded with coal for vessels, the same as on other kinds of freight.

A man bound from England to the Sandwich Islands has just made a trip westward over the Canadian Pacific in an automobile, fitted with wheels adapted to railroad track. His automobile is of English make and it is run as a special train, usually a short distance ahead of a regular passenger train.

A newly formed concern in New York City, called the Manhattan Transit Company, proposes to build 25 automobile stages, with a view to establishing regular passenger lines on some of the smoothly paved streets, to carry passengers at three cents each, for moderate distances, competing with the street cars, which charge five cents.

The trains of the Southern Pacific are now being taken to and from New Orleans by transfer steamer from Algiers, the route by way of Avondale having been put out of service by faults discovered in some of the structures. The trains delivered by the Algiers boats are run along the river front and St. Joseph street to the Illinois Central Station.

On an excursion train of 13 cars which was run to Galveston, Tex., on Sunday, September 11, there were 2,215 passengers, or, an average of 170 passengers to the car. It appears that the probable number of passengers had been underestimated, and even after taking on this large number, many others had to be left behind. On the return trip 25 cars were used.

At Chambersburg, Pa., September 10, Charles Bolan and Oscar Harman, engineman and conductor of a freight train, were sentenced to eight months in jail, and fines of $100 each, for negligence which caused a butting collision near Chambersburg on June 1, the collision having resulted in the death of Engineman Walk. It appears that at the time of the collision the conductor was in charge of the locomotive, the engineman having retired to the caboose to eat his luncheon.

Up to September 13 the validating offices at St. Louis had handled 500,000 round-trip World's Fair tickets, all these being from points distant from St. Louis 250 miles or more. Within the last few weeks the average number of tickets handled has been 8,000 a day. There are validating offices at the Union Station, at the World's Fair grounds, and at one other place in the city. At the Union Station the trembling passenger is reminded, by a sign bearing letters a foot high, that TO SIGN ANOTHER PERSON'S NAME TO A TICKET IS FORGERY. According to the *St. Louis Republic*, 75 ticket brokers have been arrested in St. Louis during the past summer.

On the occasion of the Knights Templars' encampment at San Francisco, this month, the Oregon Short Line, which operates a section of the Southern Pacific from Ogden westward, ran 36 special trains over the Ogden-Lucin cut-off, which were scheduled from Green River, Wyo., to Sparks, Nev., 755 miles, in 20 hours 40 minutes. Only two of these trains were behind time in reaching Sparks, and most of them were run through in less than 20 hours. One made the run in 16 hours 35 minutes. The distance by the cut-off is about 43 miles less than by the old route, but the time saved is about four hours, much helping engine mileage being done away with. A dining car was run on each of the 36 special trains.

The United States Express Company has made a contract with the Interborough Rapid Transit Company, New York City, by which cars for parcels will be run on the elevated railroad lines in Manhattan between the north and south ends of the city. There will be few, or no, way stations for express business, except in the region north of Central Park. This action of the United States Express Company appears to have been stimulated by the recent virtual consolidation of the Metropolitan Express Company with the American. The Metropolitan is a company which within the past two or three years has built up a large suburban express business on the surface street car lines of Manhattan, the Bronx, Yonkers and Mount Vernon. It is said that other express companies will soon make use of the elevated lines.

Judge Wellborn, of the United States Circuit Court, at Los Angeles, in the case of the Interstate Commerce Commission against the Southern Pacific and Atchison, Topeka & Santa Fe and their connecting lines, has granted the injunction asked for, holding that the arbitrary routing of citrus fruit shipments by initial lines is opposed to the provisions of the interstate commerce act in that it destroys competition and places the shipper at the mercy of the railroad company. The railroads claimed that the arbitrary routing was for the purpose of stopping the rebate system, which was to the detriment of the small shippers, and in order to maintain the tariff rates; but Judge Wellborn holds that this position is untenable and against both the letter and the spirit of the interstate commerce act.

At a meeting of traffic officers of the principal western railroads in Chicago last week, it was decided that a regular meeting shall be held every month, and, according to the newspaper reports, the executive officers intend to be present at these meetings. A movement of this kind was started about a year ago, but after a time the higher officers remained at home and sent subordinates in their places. This had the usual result: the reports of petty rate cutting became common. It is said that during the past few months large numbers of special tariffs have been issued for the sole purpose of securing some particular shipment. At the meeting last week it was agreed that hereafter such special tariffs, making changes in rates, shall be sent to the freight association the same as to the Interstate Commerce Commission.

The main line of the New York Central between Albany and Syracuse has been divided into three despatching divisions: Albany to Yosts, 49 miles; Yosts to Utica, 46 miles, and Utica to Syracuse, 52 miles. Heretofore this division has been divided into only two despatching divisions, and the increase in the force of despatchers is made for the purpose of enabling freight trains to run on the passenger tracks ahead of delayed passenger trains with greater facility than heretofore. Henceforth a freight train will receive the right to the road by semaphore signals, without written order, according to the method that has been in use on the main line of the Pennsylvania for several years, as well as on a few other roads. A freight, when running on a passenger track, will have the same right to the road as any other train, and no attention need be paid by it to the schedules of following passenger trains. The block signalmen, being instructed by the despatcher, will keep watch of the trains and turn them on to a freight track or a siding when necessary.

An Up-to-date Caution Signal.

Two ten-year-old boys saved the fast Portland express on the Burlington from wreck near Grand Island recently by waving sunflowers to the engineer. The boys while at play discovered the mile long bridge over the Platte River near that city to be on fire. One of them remembered the fast train was due, but they had nothing to use as signals. A dense growth of sunflowers, just now richly yellow in color, lined the track, and these they used with effect.—*Lincoln (Neb.) Press Despatch.*

Hollow Staybolts.

A number of claims in favor of the hollow staybolt are set forth in a leaflet which the Falls Hollow Staybolt Company, Cuyahoga Falls, Ohio, is distributing to the motive power departments of the different railroads. It claims that the air passing through the hole in the staybolt lowers the temperature of the bolt and reduces it to a moderate heat and thus saves the staybolt the native elasticity of the iron. By retaining this elasticity in the staybolt the strains on the sheet are relieved and the sheets are less liable to fracture. It is also claimed that the air which passes through the holes in the staybolt to the fire tends to produce better combustion, and that the hole through the bolt gives a sure warning of breaks.

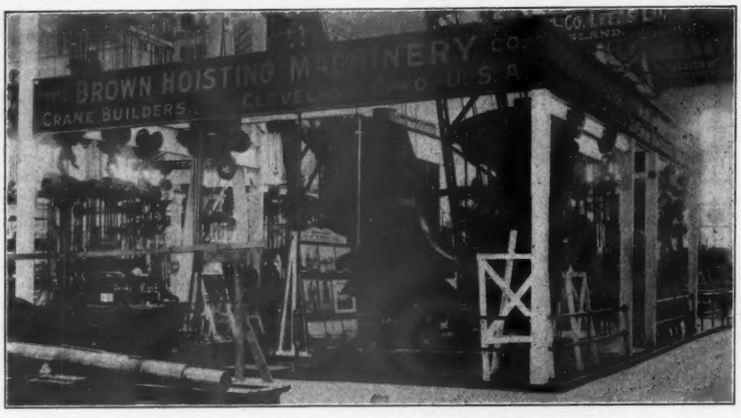
M. C. B. Association Circulars.

The Committee on Subjects of the M. C. B. Association has sent out a circular requesting suggestions for suitable subjects for the noon-hour discussions at the next convention and also subjects for investigations by committees during 1905-1906 to be reported to the convention in June, 1906. Replies should be sent to Mr. J. S. Chambers, Supt. of Motive Power, Atlantic Coast Line, Wilmington, N. C.

The secretary of the Association announces that at the last convention, the price for lumber in the freight car rules was changed from 2½ cents to 3 cents per foot, but no corresponding change was made in the passenger car rules. As this was evidently an oversight, the Arbitration Committee has decided that the price for lumber per foot in the passenger car rules should be 3 cents instead of 2½ cents, in order to make it conform to the price given in the freight car rules.

An Exhibit of Hoisting Machinery.

The Brown Hoisting Machinery Company, Inc., Cleveland, Ohio, have an interesting exhibit at the St. Louis Exposition. It consists of two locomotive cranes, one of 15 tons and one of 10 tons lifting capacity. Both of these cranes were used by the Exposition Company in installing heavy exhibits and will be used again when the exposition is over for dismantling and reloading exhibits.



An Exhibit of Hoisting Machinery.

The 10-ton locomotive crane has a 30 ft. boom and is equipped with a Brownhoist two-rope grab bucket, and is shown in operation shoveling iron ore from a 12-ft. circular pit under the crane.

In addition to these cranes the company exhibits a full line of its overhead trolleys and tramrail, including plain and geared trolleys and electrically operated trolleys. The latter are shown in operation.

This company is also distributing to every one visiting their exhibit a pack of 16 cards. Each card is descriptive of a standard type of crane.

Bids for New Battleship.

Specifications have been issued and bids will be opened at the Navy Department on Dec. 15 for the construction of the New Hampshire, a first class battleship carrying the heaviest armor and armament for vessels of her class on a trial displacement of not more than 16,000 tons, and to cost, exclusive of armor and armament, not over $4,400,000. The ship will be 450 ft. long and 76 ft. 10 in. beam. Her engines will be of the vertical twin-screw, four-cylinder, triple-expansion type, with a combined i.h.p. of 16,500 and with out-board turning propellers when going ahead. There will be 12 water-tube boilers in six water-tight compartments and a bunker capacity of 2,350 tons of coal.

Railroad Lectures at Iowa State College.

The Iowa State College has arranged a series of ten lectures to be delivered during the present college year by officials of the various railroad systems operating in Iowa. The first lecture was delivered September 14th by Judge J. C. Davis, Chief Attorney for Iowa of the C. & N. W. Railroad system, upon the subject, "The Relations of the Railroads as Common Carriers to the State and Federal Governments." Mr. Davis treated the legal side of the relations of the railroads to the Government and public from a historical point of view, dividing the development of the present state of affairs into three periods. In the first, lasting until 1850, the railroads were legally considered as improved highways. In the period from 1850 to 1870 occurred the great development of the science of railroad operation and a struggle ensued between the public and the railroads, which strove to operate simply as private corporations free from governmental control. Since 1870 there has occurred the period of limited governmental regulation of the railroads. At the present time the railroads cordially accept the right of the public to such limited regulation. Other dates and subjects for the course of lectures are as follows: Oct. 5, "Railroad Accounting"; Oct. 26, "Tie and Timber Preservation"; Nov. 16, "Motive Power"; Jan. 4, "Relation of the Railroads to the Producers"; Feb. 1, "Relation of the Railroads to the Producers"; Feb. 22, "Signal Engineering"; April 12, "Maintenance of Way." The arrangements for this course of lectures have been made largely through the kindness of Mr. W. H. Whalen, Supt. C. & N. W. Railroad, Boone, Iowa. The course has received much attention and approbation throughout the State, and it is hoped that it will be found of interest and value, not only to the students of the college but also to the general public.

An Exhibition of American Railroad Appliances at Washington, D. C.

At the Saratoga meeting of the Railway Supply Men's Association a resolution was adopted authorizing Mr. George A. Post, Chairman of the meeting, to select a committee to have charge of an exhibit of railroad appliances to be held in connection with the seventh annual session of the International Railway Congress at Washington, D. C., on May 3-13, 1905. On September 8, a meeting called by Mr. Post was held at 160 Broadway, New York, at which the general committee of arrangements for the exhibition was finally constituted and organized as follows:

Chairman, George A. Post, President, Standard Coupler Co.
Treasurer, Charles A. Moore, Manning, Maxwell & Moore.
Secretary and Director of Exhibits, J. Alexander Brown.
H. P. Bope, Vice-President, Carnegie Steel Co.
L. F. Braine, General Manager, Continuous Rail-Joint Co. of America.
A. E. Brown, Vice-President, Brown Hoisting Machinery Co.
J. A. Brill, Vice-President, J. G. Brill Co.
J. B. Brady, Vice-President, Standard Steel Car Co.
O. H. Cutler, President, American Brake-Shoe & Foundry Co.
C. A. Coffin, President, General Electric Co.
F. H. Eaton, President, American Car & Foundry Co.
H. Elliot, Jr., Vice-President, Elliot Frog & Switch Co.
William Goldie, Sr., William Goldie, Jr., & Co.
F. N. Hoffstot, President, Pressed Steel Car Co.
H. S. Hawley, President, Railroad Supply Co.
A. B. Jenkins, Jenkins Bros.
Alba B. Johnson, Baldwin Locomotive Works.
B. F. Jones, Jones & Laughlin Steel Co.
A. M. Kittredge, Vice-President, Barney & Smith Car Co.
W. V. Kelley, President, Simplex Railway Appliance Co.
E. B. Leigh, Vice-President, Chicago Railway Equipment Co.
Wm. Lodge, President, Lodge & Shipley Machine Tool Co.
Gen. Charles Miller, President, Galena-Signal Oil Co.
Hon. Franklin Murphy, President, Murphy Varnish Co.
D. C. Noble, President, Pittsburg Spring & Steel Co.
H. Kirke Porter, H. K. Porter Co.
A. J. Pitkin, President, American Locomotive Co.
Alfred A. Pope, President, National Malleable Castings Co.
H. S. Paul, President, Verona Tool Works.
C. W. Sherburne, President, Star Brass Mfg. Co.
C. A. Starbuck, President, New York Air-Brake Co.
W. W. Salmon, President, General Railway Signal Co.
H. A. Sherwin, President, Sherwin-Williams Co.
Albert Waycott, Vice-President and General Manager, Damascus Brake-Beam Co.
H. H. Westinghouse, Vice-President, Westinghouse Air-Brake Co.
W. W. Willits, Vice-President, Adams & Westlake Co.

At the meeting of the general committee of arrangements the Chairman, Mr. Post, delivered an interesting address, in which he said: In May, 1905, the International Railway Congress will be held in Washington, D. C. This dignified and influential body meets but once in five years, and for the first time in its history will meet in the United States. Its membership comprises the managerial heads of the government and independent railroads of most of the foreign countries of the world, together with the officials of similar rank of the railroads of America. It is expected that about a thousand of the most able, distinguished and potential railroad officials of the world will be in attendance upon this meeting of the Congress. It will be an event of great importance and deep interest in railroad circles, and will attract world-wide attention.

The meeting of the Congress in our country was the result of strenuous efforts on the part of American railroad officials, seconded by the President of the United States through the State Department, and now that the great honor has been conferred upon our country, it is the natural desire of those deeply interested in the Congress and responsible for its meeting in America, that it shall be attended with such success as shall send the foreign visitors home with enlarged and heightened views of American methods and appliances.

At the annual meeting of the Railway Supply Men's Association, in connection with the Master Mechanics' and Master Car Builders' Associations, held in Saratoga, in June, 1903, a resolution was adopted, asking the officials of the American Section of the International Railway Congress if it would be agreeable to them to have an exhibition of American railroad appliances made in connection therewith. To this inquiry came the response that such an exhibition would be welcomed as a valuable and desirable auxiliary to the Congress. Just prior to the annual meeting of the Master Mechanics' and Master Car Builders' Associations for 1904, a meeting of the Executive Committee of the American Section of the Congress was held in Washington, presided over by Mr. Stuyvesant Fish, President of the Illinois Central Railroad. It was most graciously intimated that the presence of Mr. J. Alexander Brown and myself, as the Secretary and Chairman respectively at that time, of the Executive Committee of the Railway Supply Men's Association, would be agreeable for the purpose of discussing the proposed exhibition. Mr. Brown and myself were most hospitably received by the railroad officers there gathered, and were given to understand that such an exhibition was most cordially approved.

Resolutions approving the project and providing for the creation of a Committee of Arrangements, were unanimously adopted by the Supply Men in session at Saratoga on June 21, 1904, and the duty was imposed upon me to select a committee representing the supply trade as represented before

the Master Mechanics' and Master Car Builders' Conventions, to act in conjunction with representatives of the Road and Track Supply Association to the end that a General Committee, representing the allied railroad supply trade, might be constituted to carry on the work.

This meeting is the result of the preliminaries herein above recited. The duty assigned me was a delicate and arduous one. In its performance I have sought to be controlled solely by what seemed to be necessary for the welfare of this undertaking. Restricted to a certain number by the resolutions by virtue of which my authority was conferred, I could name but a few of the many who are worthy of and whose interests might rightly be considered entitled to such recognition. My conscience is void of offence in this respect; I have played no favorites, nor have I ignored any one from prejudice. Confronted with a wealth of material, I was compelled to choose a fixed number. Nothing short of a Committee of the Whole would have included all who by achievement, fitness and repute would have ornamented and added strength to the committee.

It remains for this committee to proceed to organize the exhibition. To make it a success requires that the manufacturers of railroad appliances of our country shall be acquainted with the great privilege to be accorded them through the medium of the proposed exhibition. If the exhibition of our wares before the numerous associations of the various branches of the railroad industry in our country, which meet annually, have proven of value to us, and we know they have, then it requires no argument to prove that an exhibition that will be witnessed by railroad managers from all over the world, cannot fail to be productive of results that will ramify through all the arteries of the railroad supply trade, giving wider markets for our goods, and adding to our wealth and prestige.

To the manufacturer who seeks export trade, the presence in this country of over five hundred foreign railroad men with the power of purchase, with the time and inclination to examine his product, is surely a consummation devoutly to be wished. To him such an opportunity was never before offered. This will be distinctively an exhibition of railroad appliances for the exclusive scrutiny of railroad men. It will be held in a city wherein there is less to detract from the importance of this particular exhibition than would be the case in any of the great commercial centers of the country. It will be held at a season when the Federal Congress is not in session and there will be better facilities for accommodating the crowds that will attend the International Congress and our exhibition than otherwise.

To the manufacturer whose appliances are not adaptable to foreign railroad use, but designed solely for American practice, the presence in attendance upon the Congress of a large number of American railroad executive officials should be sufficient inducement for him to make an exhibit. It should not be forgotten that this will be the first exhibition of railroad appliances ever made primarily for the observation of American railroad managers and under such auspices as will insure a cheerful and patient examination thereof. We shall be there, if not actually upon their invitation, at least with their cordial approval.

The American manufacturer is ever alert to improve an opportunity to exploit his goods, and if this committee shall spread abroad to the manufacturers the tidings that such a splendid opportunity is open to them to attract the eyes and ears of so many railroad officials, who control the purse strings of the world's railroads, I believe that there will be installed at Washington next May a mechanical symposium that will amaze, instruct and entertain the railroad officials there assembled. If I know anything about the energy, foresight, ability and get-there proclivities of the American manufacturer of railroad appliances, he will be in Washington in such shape that the American railroad official will be proud of him, and the American meeting of the International Railway Congress will long be remembered because he was there.

At the threshold of our work we are confronted with an obstacle which must be overcome if our proposed exhibition shall prove a success. Overcoming obstacles, however, is what the American manufacturer is doing every day, so that the existence of an obstacle is not at all depressing. It is, rather, a stimulus for work. There is just one place in Washington whereon the proposed exhibition must be located, and that is what is known as the "White Lot," being a large acreage back of the White House grounds and stretching to the Potomac. It is an ideal location. It is, however, a government reservation, and the Federal statutes prohibit the erection of any temporary structures thereon, except by Act of Congress. We must secure permissive legislation at the earliest possible moment after the convening of the Federal Congress on the first Monday in December next. There are precedents established for such legislation, as such special acts have been passed heretofore in connection with the Grand Army Encampment and the Inaugural ceremonies.

The international character of our enterprise constitutes a convincing argument for the legislation desired. Our exhibition is for the purpose of widening the market for American manufactures; we seek foreign trade. The Federal Congress is constantly agitating measures for the accomplishment of this very purpose. How to upbuild the merchant marine is at the present moment a live topic of Congressional study. Of what use are bottoms flying the American flag if there are not cargoes for those bottoms? The mainspring of our proposed exhibition is the furnishing of freight for the bottoms that ride the ocean. Our appeal for the use of the "White Lot" is based on practical patriotism. We want to send more goods to the foreign marts, and if we can create a demand therefor, then there is more work for American labor.

The industry that we represent runs high into the millions of invested capital, and the army of skilled workmen employed therein is numbered by the scores of thousands.

It would be strange indeed if the brief use of a few acres of the government soil should be denied to a body of its citizens who would use it solely for the advantage of the people, as its results would be far-reaching in the distribution of wealth by creating an increased demand for the labor of the country.

It is our duty to show to the Senators and Congressmen that our request is grounded upon reason, and we must each, individually, at once begin the campaign of education and see to it that all those engaged in our industry shall seek to reach the ear of all members of the Congress they know, and secure pledges of approval of the legislation we ask.

From now until action is taken upon the bill that will be introduced in both Houses of Congress at the opening thereof, all our energies must be focussed upon the passage of that bill. With favorable action by Congress promptly taken, the details of the exhibition itself will easily be cared for.

After a careful consideration of the subject, and with a thorough knowledge of the alternative facilities that Washington might offer, I am convinced, and I say frankly, that if such an exhibition as we propose to make cannot be located on the "White Lot," the enterprise will have to be abandoned.

In order that there may be an assurance to all who may participate in the proposed exhibition in connection with the International Railway Congress, that such funds as shall be contributed for carrying on the work of the committee will be expended frugally and under the critical eye of one whose name is a guarantee of trustworthiness and administrative ability throughout the railroad supply world, I have requested and, after urgent appeal, secured the assent of our distinguished colleague, Mr. Charles A. Moore, to serve as Treasurer of the committee. I am confident that you will heartily confirm this selection and join me in thanks to Mr. Moore for consenting to assume this responsibility.

I am happy to state also that for Secretary of the Committee and Director of Exhibits, I have been so fortunate as to secure the consent of Mr. J. Alexander Brown, Manager of the Railway Equipment and Publication Company, to serve us. Mr. Brown is now serving his third year as Secretary of the Railway Supply Men's Association in connection with the Master Car Builders' and Master Mechanics' Associations, and has been Secretary and is now Vice-President of the Road and Track Supply Association, in which positions he has demonstrated rare organizing talent and he is splendidly equipped for the arduous work that will devolve upon that officer of this committee. I will say frankly that but for Mr. Brown's assurance that his services would be at our disposal, I would have been loath to undertake the responsibility that will fall to my lot in this enterprise. Your confirmation of this selection I have no doubt will be given, with the feeling that we are under obligations to Mr. Brown for the valuable co-operation he vouchsafes to us.

It is understood, of course, that no officer of this committee is to receive any compensation for his services; only the necessary and actual expenses of the officers, incurred by or for them solely for the benefit of this committee, are to be paid.

I recommend that the name of this organization shall be: American Railway Appliance Exhibition in connection with The International Railway Congress, May, 1905.

Any corporation, association, co-partnership or individual engaged in the manufacture or sale of appliances or material used in the construction, operation or maintenance of railroads in the United States, should be eligible for membership in this Association, and should have the privilege of making an exhibit, upon payment of the prescribed fee, subject to the regulation of this committee.

Manufacturing and Business.

The Globe Machine & Foundry Co. has been incorporated in Pennsylvania with a capital of $60,000. Charles Denn, of Philadelphia, is Treasurer.

The Bromall Iron & Steel Co., of Belington, W. Va., has been organized in Pittsburg with a capital of $300,000 and is looking for a site for its new works.

Bids are wanted October 6 by the Isthmian Canal Commission for five steam shovels from 65 to 75 tons in weight and for six shovels from 90 to 100 tons in weight.

The Platt Iron Works Co. has been incorporated in Ohio with a capital of $1,600,000 to carry on the business of the Stillwell-Bierce & Smith Vaile Co., of Dayton, Ohio.

The Atwood Primary Electric Co., of Portland, has been incorporated in Maine with

a capital of $1,000,000. J. G. Morton is President, and H. C. Hall, Treasurer, both of Boston.

Bids are wanted October 11 by the Bureau of Supplies and Accounts, Washington, D. C., for a quantity of machine tools for the navy yards in the eastern section of the country.

Harold C. Dayton, for a number of years identified with the railroad supply business, has been appointed manager of the New York office (15 Cortlandt street) of the Davenport Locomotive Works.

The Mesta Machine Co., of Pittsburg, it is reported, has given the contract for the complete equipment of its new plate and sheet mills to the Allegheny Iron & Steel Co., of Tarentum, Pa.

E. L. Vandresar, formerly with the Diamond State Steel Company, Wilmington, Del., has been appointed traveling representative of the Independent Railroad Supply Company, Chicago, Ill.

The Ruthenburg Reduction Co., of Lockport, has been incorporated in New York with a capital of $20,000, to make iron, by M. C. Ruthenburg, of Lockport; J. W. Warner, of Oneida, and W. K. Pierce, of Syracuse.

The Board of Public Works of Indianapolis, Ind., has passed an ordinance to pay $25,000 as the city's share of the cost of separating the street and track crossings at Massachusetts avenue and East Tenth street. Bids will be asked for the work as soon as the City Engineers complete the plans.

The York Haven (Pa.) electric power plant now supplies power for the local and suburban electric cars in York, and also for a number of the larger manufacturing plants in the city. The York Haven corporation has also contracted with the Edison Electric Light Company to supply the necessary current for lighting the city.

The Seamless Tube Co. of America, it is reported, has given contracts for its new works at Monessen, Pa., to the McClintic-Marshall Construction Co., Pittsburg, for steel work (about 700 tons); to A. & S. Wilson, Pittsburg, for putting up the brick and steel buildings, and to the T. A. Gillespie Co., Pittsburg, for the concrete foundation work.

The New York Continental Jewell Filtration Company, 15 Broad street, New York City, have recently made a number of sales of its filters for miscellaneous uses. Some of the sales were as follows: Grand Hotel, Caledonia Springs, Prov. of Quebec, Canada; New York Telephone Company, New York; Dr. Reginald Allen, Philadelphia, Pa.; J. A. Roebling's Sons Company, Trenton, N. J., and the Lehigh Valley Railroad Company, Easton, Pa.

Iron and Steel.

The Tennessee Iron & Land Co., of Dickson, Tenn., recently organized with a capital of $50,000, is planning works near that place to have a capacity of 100 tons a day.

The Carnegie Steel Co., it is reported, has received orders for 7,500 tons of the highest grade of nickel steel ½ to ¾ in. thick from San Francisco, and a similar amount from New York. This is in addition to the 7,500 tons now being rolled at the Carnegie works.

The Republic Iron & Steel Co. announce their intention to install large finishing mills at their Bessemer steel works at Youngstown, Ohio, for rolling sheet and tin-plate bars. This company has never made these products, but will in future supply them for independent sheet and tin-plate mills.

At the billet meeting held in Pittsburg September 19 there were representatives from the Carnegie Steel Co.; the Jones & Laughlin Steel Co.; the Cambria Steel Co., of Johnstown, Pa.; Pennsylvania Steel Co., Steelton, Pa.; Republic Iron & Steel Co., of Chicago; Labelle Co. Iron Works, Steubenville; Wheeling Steel & Iron Co., Wheeling, W. Va., and the Ashland Steel Co., of Ashland, Ky. A reduction of $3.50 per ton was made in the price of billets and $2 per ton in the price of sheet and tin bars. Open-hearth billets 4 x 4 in. were reduced from $23 to $19.50 per ton; sheet and tin bars, from $24 to $22 per ton, and cut sheet and tin bars, from $24.50 to $22.50 per ton.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies see advertising page 30.)

American Association of Traveling Passenger Agents.

The annual meeting of this association is to be held in Mexico City in December. A special train will leave St. Louis December 3 for the City of Mexico. The programme includes a paper on "Tourist Department as a Means of Originating Foreign and Domestic Passenger Business."

The Master Car and Locomotive Painters' Association.

At the annual convention held in Atlantic City September 14, the principal address was delivered by P. A. Brazier, Superintendent of Rolling Stock of the New York Central. J. F. Lanferseik, of the Pennsylvania Lines. Columbus, Ohio, was elected President, and Robert McKeon (Erie), Kent, Ohio, Secretary and Treasurer.

Railroad Clubs at the St. Louis Fair.

Tuesday, Sept. 27th, has been fixed as Railroad Club Day at the Louisiana Purchase Exposition. The members of all of the railroad clubs in the country have been invited to meet in joint session, which will be largely a social one, in the reading room of the Transportation Building. Addresses of welcome will be made on behalf of the Exposition, the exhibitors and the St. Louis Railway Club. The individual members of all railroad clubs are invited; also railroad men generally, and railroad supply men.

American Society of Civil Engineers.

At the meeting held September 21, papers were presented for discussion, as follows: "General Methods for the Calculation of Statically Indeterminate Bridges, as used in the Check Calculations of Designs for the Manhattan Bridge and the Blackwell's Island Bridge, New York," by Frank H. Cilley, S. B.; "A Rational Form of Stiffened Suspension Bridge," by Gustav Lindenthal, M. Am. Soc. C. E.; and "Theory and Formulas for the Analytical Computation of a Three-Span Suspension Bridge with Braced Cable," by Leon S. Moisseiff. These papers were printed in the August *Proceedings*.

PERSONAL.

—Mr. H. H. Steele, who was recently appointed Traffic Manager and Auditor of the Flint River & Northeastern, has, for the last three years, been connected with the Hawkinsville & Florida Southern as General Freight and Passenger Agent. Mr. Steele began railroad work at the age of 15, and has served on the Atlantic & Gulf, the Louisville & Nashville, the Central of Georgia, the Central Americus & Montgomery (now a part of the Seaboard Air Line), the Atlantic, Valdosta & Western, and the Southern.

—Col. Alexander Macomb Miller, Corps of Engineers, U. S. Army, died suddenly from heart disease on Sept. 14 on the steamer Potomac near Irvington, Va. He was returning from an inspection of some Government works on the Rappahannock River at the time. At the time of his death Col. Miller was in charge of the Washington Aqueduct, Potomac River, improvements and the new filtration plant under construction at Washington, beside river and harbor and other important works at various other points.

—Mr. G. R. Henderson has opened an office at 20 West Thirty-fourth street, New York, for the transaction of general consulting and active work on all phases of mechanical engineering. As Mr. Henderson has had 25 years' experience in the motive-power departments of some of the largest railroads in this country, he is fully capable of executing satisfactorily all orders which he may receive. Among the railroads with which Mr. Henderson has been associated at various times are the Chicago & North Western, Pennsylvania and Norfolk & Western.

—Mr. W. L. Pierce, whose promotion to the Superintendency of the Jacksonville Division of the Southern Railway at Jacksonville, Fla., has been announced, has been connected with this company, and its predecessors, for the past 23 years. Mr. Pierce

was born in Clark County, Va., and began work at the age of 16, as a night operator, from which position he worked up to that of despatcher. In 1888, he was city passenger and ticket agent at Lynchburg, Va., and two years later was made Assistant General Freight Agent. In 1891 he was made Agent at Lynchburg, in charge of both traffic and transportation. In October, 1903, he was appointed Trainmaster on the Danville Division, and on the first of this month was promoted to be Superintendent at Jacksonville of the Southern and the St. John's River Terminal Company, to succeed W. L. Williamson.

—Mr. William A. Pratt, Assistant to Chief Engineer Brown of the Pennsylvania, who has been incapacitated for duty by rheumatism during the past six months, died at his home on September 19 at the age of 50 years.

—Mr. Philo H. Goodwyn, formerly and for many years in the freight department of the Gulf, Colorado & Santa Fe, died at San Antonio, Texas, on Sept. 10, at the age of 44. Mr. Goodwyn was born in New Orleans, La., and began his railroad service as a clerk in Houston for the Houston Direct Navigation Company. His next position was that of clerk in the office of the general freight

agent of the Houston & Texas Central. He later became rate clerk in the general freight office of the San Antonio & Aransas Pass at Houston. From there he went to the Memphis & Little Rock, but soon returned to the San Antonio & Aransas Pass. He then became chief rate clerk on the Gulf, Colorado & Santa Fe, but shortly was promoted to be Assistant General Freight Agent, and finally General Freight Agent, which position he held until a few months ago.

—Mr. Fitch D. Adams, one of the oldest retired Master Car Builders in the country, died last week at his home in Buffalo at the age of 82 years. Mr. Adams began his work in 1847 with the Norwich Car Co. at Norwich, Conn., where he remained for six years. He then went to Buffalo as a contractor in the Buffalo Car Works, and in 1859, he entered railroad service as Master Car Builder on the Buffalo & Erie, now a part of the Lake Shore & Michigan Southern. He held this position until 1868, when he became Superintendent of the Ohio Falls Car Co. In 1870, he became Master Car Builder on the Boston & Albany, where he remained for 26 years, resigning in 1896 from active work. Mr. Adams was a charter member of the Master Car Builders' Association and was one of the thirteen that met at Adrian on the 19th day of September, 1866. Of that number three only remain. He was one of the company of superintendents and master car builders that met at the Palmer House in Chicago on the 14th and 15th days of December, 1876, to formulate a code of rules that should govern the condition and repairs of freight cars offered in interchange. Mr. Adams never missed attending the meetings of the Association; he was President of the Association in 1871. What Antony said of Brutus can truthfully be said of him: "His life was gentle and the elements so mixed in him that nature might stand up and say to all the world, this was a man."

ELECTIONS AND APPOINTMENTS.

Atlantic & North Carolina.—E. A. Niel, hitherto General Freight Agent for the Southern, with headquarters at Atlanta, has been appointed General Traffic Manager of the Atlantic & North Carolina, with headquarters at Goldsboro, N. C., effective October 1.

Central of New Jersey.—H. McK. Twombly has been elected a Director, succeeding the late J. Lowber Welsh.

Chicago, Peoria & St. Louis of Illinois.—A. Wood has been appointed Assistant to the General Manager.

Cincinnati, Hamilton & Dayton.—F. B. Clark, heretofore Superintendent of Bridges & Buildings on the Denver & Rio Grande and Rio Grande Western, has been appointed Superintendent of Bridges & Buildings on the C., H. & D., with headquarters at Cincinnati, Ohio.

Cleveland, Cincinnati, Chicago & St. Louis.—W. P. Deppe, Chief Assistant General Passenger Agent at St. Louis, has tendered his resignation, to take effect October 1. Mr. Deppe will in future be associated with the Wall Street firm of Daugherty & Albers.

Delaware, Lackawanna & Western.—R. W. Walker, Jr., has been appointed Foreman of Bridges and Buildings for the Central New York portions of the Binghamton and Oswego divisions of the D., L. & W., with headquarters at Syracuse, succeeding C. L. Woodward, retired.

Denver & Rio Grande.—T. E. Swann, formerly Assistant General Passenger & Ticket Agent, has accepted a position with the Traffic Bureau of the Louisiana Purchase Exposition at St. Louis.

El Paso & Southwestern.—C. J. Hartman, Assistant General Superintendent at El Paso, Tex., has resigned.

Hocking Valley.—S. E. Clark, formerly District Freight & Passenger Agent of the Zanesville & Western, has been appointed Northern Passenger Agent at Detroit.

Lehigh Valley.—Captain J. M. Cherry, heretofore connected with the Marine Department of the Erie, has been appointed Superintendent of Floating Equipment for the Lehigh Valley.

Missouri Pacific.—E. Jones has been appointed Master Mechanic at Baring Cross, Ark., succeeding Thomas Paxton.

Nashville, Chattanooga & St. Louis.—At the annual meeting of this company on September 14, Henry Walters, Chairman of the Board of Directors of the Atlantic Coast Line, was elected a director, succeeding J. C. Atwater.

National of Mexico.—P. F. Flavin, Foreman Boiler Maker at the Laredo shops, has been appointed Acting Master Mechanic at Laredo, succeeding James Farrell, promoted.

Panama Railroad.—The executive committee has elected William Barclay Parsons a director in place of George Whaley, Director and First Vice-President, residing in Paris, who has resigned.

Peoria & Pekin Union.—J. W. Hill, heretofore Master Mechanic and Master Car Builder at Peoria, Ill., has resigned his position.

Pittsburg, Shawmut & Northern.—A. G. McComb, hitherto Engineer of Maintenance of Way, has been appointed Chief Engineer, with headquarters at Olean, N. Y.

Pittsburg Terminal Railroad & Coal Company.—H. J. Lawrence, Vice-President & Traffic Manager, has resigned to become Traffic Manager of the M. A. Hanna Co., Cleveland, Ohio.

Southern.—T. W. Evans has resigned as Roadmaster of the Birmingham division at Birmingham, Ala., to engage in other business.

Temiskaming & Northern Ontario.—J. H. Black has been appointed General Traffic Manager, with headquarters at Kingston, Ont.

Trans-Continental Railway.—The Trans-Continental Commission announces that M. J. Butler, Chief Engineer of the Montreal Locomotive Works, and formerly Chief Engineer of the Bay of Quinte Railway & Navigation Co., has been appointed Assistant Chief Engineer of the Trans-Continental Railway Commission, and will have charge of building that part of the Grand Trunk Pacific belonging to the Government. A. E. Doucet, Chief Engineer of the Quebec & Lake St. John, has been appointed District Engineer for the district extending from the New Brunswick-Quebec boundary line to Clear Lake, Que. A. M. Molesworth has been appointed District Engineer of the district from Clear Lake to the Ontario boundary.

Wabash.—H. J. Foale has been appointed Signal Engineer, with headquarters at Decatur, Ill.

Western Pacific.—At a recent meeting of the Directors, Edwin Hawley, W. H. Taylor and E. T. Jeffery were elected to the board.

Wheeling & Lake Erie.—C. W. Coe, formerly Traveling Engineer, has been appointed Assistant Superintendent, with headquarters at Columbia, Ohio, succeeding K. C. Nicoles, resigned. E. D. Shedd will succeed Mr. Coe.

Wisconsin Central.—W. G. Whitcomb, Trainmaster at Minneapolis, has been appointed Assistant Superintendent, with headquarters at the same place. A. J. VanValkenburg, Trainmaster at Abbottsford, has been appointed Assistant Superintendent at Fond du Lac, Wis.

LOCOMOTIVE BUILDING.

The Central of New Jersey is having 10 locomotives built at the Baldwin Locomotive Works.

The Canadian Pacific is having 20 locomotives built at the Schenectady works of the American Locomotive Co.

The Erie is reported to be figuring on placing an order for from 50 to 100 locomotives. We understand, however, that bids have not been asked as yet.

The Chicago & Western Indiana, as reported in our issue of August 19, has ordered three double-end suburban locomotives from the Rogers Locomotive Co. The specifications for these locomotives are as follows: Cylinders, 18 in. x 26 in.; three pairs of driving wheels, 63 in. in diameter; radial two-wheeled leading truck; two trailers, 42 in. in diameter; straight-top boiler; driving wheel base, 14 ft.; engine wheel base, 41 ft. 2 in.; grate area, 46.8 sq. ft.; tank capacity, 3,500 gallons of water, and coal capacity, 5 tons. The locomotives will weigh about 190,000 lbs., with 130,000 lbs. on drivers.

The Toledo, St. Louis & Western, as reported in our issue of September 16, is asking bids on 10 simple 10-wheel (4-6-0) locomotives. The locomotives will weigh 167,000 lbs., with 132,000 lbs. on drivers; cylinders, 19½ in. x 30 in.; diameter of drivers, 63 in.; extended wagon top boiler, with a working steam pressure of 200 lbs.; 300 Shelby steel tubes 2 in. in diameter and 14 ft. long; firebox, 108 in. long x 42 in. wide; grate area, 31 sq. ft.; tank capacity, 7,000 gallons of water, and coal capacity, 10 tons. The special equipment includes: Westinghouse brakes, Magnesia boiler lagging, Marden brake-beams on tender wheels, Major couplers, Pyle-National electric headlights, Ohio injectors, Damascus journal bearings, Northern metallic piston and valve-rod packings, Ashton safety valves, Leach sanding devices, Chicago sight-feed lubricators, Railway Steel-Spring Co.'s springs, Allen-Richardson slide valves, with Allenport & Tate flexible staybolts.

The Northern Pacific, as reported in our issue of September 9, has ordered 19 simple Mikado type (2-8-2) and six tandem compound Mikado type (2-8-2) locomotives from the Brooks Works of the American Locomotive Co. The simple locomotives will weigh 255,000 lbs., with 197,800 lbs. on drivers; cylinders, 24 in. x 30 in.; diameter of drivers, 63 in.; extended wagon top boiler, with a working steam pressure of 200 lbs.; 373 tubes 2 in. in diameter and 19 ft. 6 in. long; firebox, 96 in. x 66 in.; tank capacity, 8,000 gallons of water, and coal capacity, 12 tons. The tandem compound locomotives will weigh 263,000 lbs., with 204,400 lbs. on drivers; cylinders, 19 in. x 30 in.; diameter of drivers, 63 in.; extended wagon top boiler, with a working steam pressure of 200 lbs.; tank capacity, 8,000 gallons of water, and coal capacity, 12 tons. The special equipment for both includes: Westinghouse brakes, Gollmar bell ringers, sectional Magnesia boiler lagging, Diamond special brake-beams, steel-back brake shoes, Climax steel couplers, Hancock injectors, Leach sanding devices, Nathan sight-feed lubricators, Railway Steel-Spring Co.'s springs, Ashcroft steam gages, Midvale driving-wheel tires and cast-steel wheel centers.

CAR BUILDING.

The Detroit United Railway is in the market for 50 cars.

The Montana R. R. has ordered two day coaches from Barney & Smith.

The Cuba Company has ordered two sleeping cars from the American Car & Foundry Co.

The Contact Process Co., Buffalo, N. Y., has ordered eight tank cars from the Bettendorf Axle Co.

The Nashville, Chattanooga & St. Louis is

reported to be about to build 100 stock cars at its own shops.

The Chicago & North Western has ordered 100 box car bodies from the Western Steel Car & Foundry Co.

The Chicago & North Western has ordered three combination observation and smoking cars from the Pullman Company.

The Toledo, St. Louis & Western denies being in the market for passenger cars, as reported in our issue of September 16.

The American Car & Foundry Co. is reported to have received a contract to supply the London Underground Railway with 100 steel passenger cars.

The New York, Ontario & Western has placed an order for 40 gondola cars at its Norwich shops. Half of these cars will be of 85,000 lbs. capacity and the remainder of 60,000 lbs. capacity.

The Seaboard Air Line, as reported in our issue of September 16, is in the market for two 61-ft. combination mail and baggage cars. The special equipment includes steel axles, iron bolsters, National-Hollow brake-beams, cast-iron brake shoes, Westinghouse high-speed brakes, Janney-Buhoup couplers, twin spring draft rigging, M. C. B. cast-iron journal boxes, malleable iron journal-box lids, canvas roofs, six-wheel trucks and 33-in. steel-tired wheels.

The Chicago & Western Indiana, as reported in our issue of September 9, has ordered 28 suburban passenger cars and two combination passenger and baggage cars from the American Car & Foundry Co. These cars will be 70 ft. long, 9 ft. 8 in. wide and 6 ft. 8½ in. from top of sill to bottom of plate, with wooden frames and underframes. The special equipment includes: Simplex bolsters, National-Hollow brake-beams, Westinghouse brakes, Janney couplers, Forsyth curtain fixtures, Pantasote curtain material, Symington journal boxes and journal box lids, Pintsch gas, Standard steel platforms, Simplex Railway Appliance Co.'s springs and McKee-Fuller wheels.

The Swift Refrigerator Transportation Company has ordered 200 refrigerator cars of 60,000 lbs. capacity from the American Car & Foundry Co. for October and November delivery. The company is also building 100 refrigerator cars of 60,000 lbs. capacity at its own shops. All these cars will be 33 ft. long and 9 ft. wide. The special equipment includes: Standard Forging Co.'s axles, Bettendorf bolsters, Chicago Railway Equipment Co.'s brake-beams, Cardwell brake-shoes, Camel brasses, Westinghouse and Fitzgerald air-brakes, Major couplers, Swift standard door fastenings, doors, paint, platforms and trucks; Miner draft rigging, National Malleable Castings Co.'s journal boxes and journal box lids, F. W. Bird & Sons "torsion proof" roofs, Pittsburg Spring & Steel Co.'s springs and American Car & Foundry Co. and Griffin wheels.

BRIDGE BUILDING.

AMHERSTBURG, ONT.—The Town Council have decided to build three steel bridges over Belle River.

BINGHAMTON, N. Y.—The Delaware, Lackawanna & Western is making surveys to locate the site for a bridge to be built over the Susquehanna River.

CHAMBERSBURG, PA.—The Grand Jury has approved the recommendation for a bridge over Conococheague Creek in Hamilton Township.

CHESTERFIELD, VA.—The Board of Supervisors, it is reported, are asking bids September 26 for building a steel bridge over Swift Creek, with two spans each 60 ft. long, and with steel approaches of 200 ft.

CINCINNATI, OHIO.—A contract has been given to Grainger & Co., of Louisville, Ky., at $106,500, for building the superstructure of the Grandin road viaduct over Delta avenue. The other bids ranged up to $168,000. The contract for the substructure was awarded to Henkel & Sullivan at $19,088. Bids for the approaches were all rejected, as they were in excess of the estimated cost of $57,615, and new bids are being asked.

CLEVELAND, OHIO.—Bids are wanted October 12 by the Board of Commissioners of Cuyahoga County for building a concrete arch in Bedford Township; also a concrete steel bridge in Euclid Township. Julius C. Dorn is Clerk.

CROOKSTON, MINN.—Bids are wanted October 30 by the County Auditor for building a 200-ft. steel bridge and approaches over Red Lake at Roberts street, to cost about $10,000.

DES MOINES, IOWA.—Plans for the completion of the Melan arch at Sixth ave. will soon be ready. These provide for two additional arches, at a cost of $35,000. The total cost of the bridge will be about $100,000.

FINCH, ONT.—A by-law to raise $20,000 to build two steel bridges was carried.

FORT WAYNE, IND.—Bids are wanted September 28 by J. L. Smith, Auditor, for some concrete and steel bridge work in Allen County. A. R. Schnitker is Commissioner.

INDIANAPOLIS, IND.—Bids are wanted September 28 by the Board of Commissioners of Marion County for building seven bridges in Decatur Township, one in Lawrence, three in Pike and two in Wayne. Surveys are also being made for a bridge at Senate avenue.

INGERSOLL, ONT.—A new steel bridge will be built at Alma street.

JEFFERSON CITY, MO.—A concrete arch 40 ft. wide and 20 ft. long is to be built here. Plans are also being made for a concrete arch 100 ft. wide and 25 ft. long. J. C. Herring is City Engineer.

KITTANNING, PA.—Bids are wanted October 5 by the Supervisors of Valley Township for building an iron bridge over Pine Creek. Levi Davis is Chairman.

LONDON, ONT.—A new steel bridge will be built between Westminster and Yarmouth townships.

MACON, GA.—The Central of Georgia, it is said, will build a steel bridge over Walnut street at a cost of $15,000.

NEWARK, N. J.—The Passaic County Board of Freeholders has decided to give to F. M. Stillman Co., the lowest bidder, the contract for the new drawbridge to be built over the Passaic River, at their bid of $60,920. The other bids were: De Vegel & Colling, $61,300; F. R. Long Co., $63,250; Sandford & Harris Co., $66,000; American Bridge Co., $66,900; D. Schwiers & Sutton Co., $67,930; Cyclopean Iron Works, $69,000, and John A. Doolittle, $69,980. The Board of Commissioners of Bergen County will soon take action. The bridge is to be built jointly by the two counties.

The Essex County Park Commissioners have decided to ask bids for a steel bridge over the Lehigh Valley tracks from the Upper Elizabeth road, to cost about $15,000.

NEW YORK, N. Y.—The Municipal Art Commission has agreed to the use of wire cables in the construction of the new Manhattan Bridge, to be built over the East River between the boroughs of Manhattan and Brooklyn, and it is said that Bridge Commissioner Best will soon ask for bids for the superstructure, the foundations having been already completed.

The Board of Estimate, on August 16, appropriated $10,000 for surveys and preliminary work for the proposed Hudson Memorial bridge to be built over Spuyten Duyvil Creek, connecting Inwood Heights, Manhattan, with Spuyten Duyvil Heights, in the Bronx. It is intended to have the bridge completed for the celebration in September, 1909, of the 300th anniversary of the discovery of the Hudson River. Among the appropriations passed by the Board were $2,500,000 for the Commissioner of Bridges to pay for land taken for the Williamsburgh Bridge and $600,000 for land for the Blackwell's Island Bridge; also $200,000 for building street bridges over the railroad tracks in the Bronx.

ONTONAGON, MICH.—The Chicago, Milwaukee & St. Paul has commenced work on a bridge to be 440 ft. long, with approaches of 115 ft., over the Ontonagon River.

ORTIZ, MEX.—The large iron bridge of the Mexican Central over the San Pedro River, near this place, was destroyed by recent heavy rains.

OSHKOSH, WIS.—Bids are wanted October 1 for building the substructure of a bridge over Fox River. M. Coffey is Chairman of the Board of Public Works.

VEVAY, IND.—Bids are wanted October 14 by the Board of County Commissioners for building an iron or concrete bridge over the east fork of Indian Creek in Switzerland County. L. D. Woollen is County Auditor.

SALEM, MASS.—The County Commissioners, it is reported, have accepted the plans and will soon ask bids for the new bridge between Salem and Beverly, to cost $100,000.

Other Structures.

CHARLESTON, S. C.—Bids are wanted October 15 by the Bureau of Yards and Docks, Washington, D. C., for building a brick and steel foundry.

CINCINNATI, OHIO.—The Union Terminal Railroad Co., organized to build a union passenger station here, has completed plans, which will be submitted to the railroads.

INDIANAPOLIS, IND.—The Indianapolis Traction & Terminal Co.'s new passenger station was opened September 12.

LEWISTON, IDAHO.—The Lewiston Foundry & Machine Works is considering the question of putting up a new foundry building.

MEMPHIS, TENN.—The Union Depot Commission has completed its organization and elected John H. Watkins, Vice-President of the Memphis Trust Co., Chairman, and I. F. Peters, of the Industrial League, Secretary.

MILWAUKEE, WIS.—The Chicago & North Western has bought ground at Lincoln avenue as a site for a new freight house.

MINNEAPOLIS, MINN.—The Twin City Rapid Transit Co., of Medway, it is reported, has plans completed for new car shops to cover eight acres of ground. The largest building will be a car house, covering about 3½ acres, to cost about $200,000.

MOLINE, ILL.—The Chicago, Burlington & Quincy, it is reported, will build a large passenger station and freight house here.

NEW ORLEANS, LA.—Bids will soon be let for building the new St. Louis & San Francisco stone passenger station here.

NEWTON, KAN.—The Atchison, Topeka & Santa Fe, it is reported, will at once build additions to its roundhouse and put up a new tank shop 70 ft. x 100 ft.

PARIS, ILL.—The McGuire-Cummings Manufacturing Co., of Chicago, is building works to make cars in Paris at a cost of about $300,000.

RHINELANDER, WIS.—The Minneapolis, St. Paul & Sault Ste. Marie has bought ground at the foot of Pelican rapids as a site for its new station, to cost about $25,000.

RUTLAND, VT.—The Rutland Railroad has given a contract to Charles E. Page, of this place, for building a brick passenger station two stories high with a main building 50 x 40 ft. and wings 100 ft. x 30 ft. The building will also contain the offices of the company.

SOUTH MCALESTER, IND. T.—The Missouri, Kansas & Texas and the Choctaw, Oklahoma & Gulf will jointly build a brick union passenger station two stories high.

TORONTO, ONT.—The Grand Trunk, it is reported, will build a new roundhouse at the foot of Spadina avenue.

YOUNGSTOWN, OHIO.—The Youngstown Iron, Sheet & Tube Co. will put up a new tube mill to cost $270,000, and later will build a new skelp mill.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

BALTIMORE & OHIO.—According to press reports, this company will spend about $700,000 on improvements in Cleveland. It is the intention of the company to develop its property in this city by building several modern coal and ore machines, together with the necessary coal docks. The present dock is located on the river above the Seneca street bridge and is entirely inadequate for handling the coal which comes into the city over the Cleveland, Lorain & Wheeling.

BUREAU COUNTY MINERAL.—A charter has been granted this company in Illinois to build a railroad from a point on the western line of Bureau County to a point in the northern part of the same county. W. D. Millard, J. B. Stubbs, B. A. Dousman and others, of Chicago, are incorporators.

CANADIAN PACIFIC.—Work has been begun on the proposed extension between Toronto and Sudbury. The entire line will cost about $8,000,000. The heaviest work will be between Romford and Byng inlet, 58 miles, where the country is extremely rough, and a large amount of rock cutting will be necessary. The maximum grade will be .3 per cent. and the maximum curvature 4 deg. (August 5, p. 51.)

CANTON & YOUNGSTOWN.—Incorporation has been granted this company in Ohio to build a railroad from Canton through Stark, Mahoning and Portage Counties to Youngstown. W. A. Clark, W. L. Davis, J. J. Whitaker and others, of Canton, Ohio, are incorporators.

CENTRAL VERMONT.—An officer writes that the proposed extension of this road is from Bethel, Vt., to granite quarries, a distance of five miles. Contracts for grading will be let at once and the work will be completed this fall. The ruling grade ascending to the quarries is 3.5 per cent. compensated for by curvature, and the maximum curvature is about 8 deg. There will be no bridges or important trestles. (August 19, p. 65.)

COAL & COKE.—This company has completed that portion of the Charleston division from Otter, W. Va., to Gassaway, 28 miles. This line was open for traffic September 19. The Charleston division is now in operation from Charleston to Gassaway, 92 miles, and will eventually be extended to Elkins, some 20 miles farther. (See Construction Supplement.)

COLUMBIA RIVER & OREGON CENTRAL.—An officer writes that a contract has been let to the Pacific Coast Construction Co., of Portland, Ore., for building this road from Arlington south to Condon, 45 miles. The work is fairly light and does not include any important trestles or tunnels. Branch lines are eventually to be built from Ione southwest to Condon, 25 miles, and from Arlington west to Rock Creek, 10 miles. W. H. Kennedy, Portland, Ore., is Chief Engineer. (August 19, p. 65.)

CINCINNATI SOUTHERN.—Grading is in progress on a branch line from Cardiff, Tenn., to the Tennessee River, six miles. Borches, Bolt & Koon, Knoxville, are the contractors.

COLORADO, TEXAS & MEXICO.—Grading is reported in progress at Abilene, Tex., on this proposed road, which is to run from Washburn, Tex., in the Panhandle, to San Antonio, 400 miles. Surveys have been finished and rights of way secured for most of the way. At Washburn the road will connect with the Southern Kansas, the Fort Worth & Denver City and the Rock Island. It will cross the Texas & Pacific at Abilene. The Rock Island, it is reported, is back of the project.

DENVER & INTERURBAN.—This company has been incorporated in Colorado for the purpose of electrifying certain portions of the Colorado & Southern in the vicinity of Denver, including the line from Denver to Boulder, 30 miles; the line from Denver to Idaho Springs, 37 miles, and the Lafayette branch. The authorized capital of the company is $3,000,000. A. D. Parker, J. M. Herbert, G. M. Dodge and others are incorporators.

ERIE & MICHIGAN RAILWAY & NAVIGATION.—An officer writes that the proposed route of this road is not definitely located, but that it is the intention of the company to build from Alabaster, Iosco County, Mich., to a connection with the Michigan Central at Standish. Work will be begun within a month, and the line will probably be completed before the end of the year. O. B. Englisch, 184 La Salle street, Chicago, is Vice-President and General Manager. (August 26, p. 73.)

GRAND TRUNK PACIFIC.—The Trans-Continental Railroad Commission, which is acting for the Dominion Government in building the eastern section of this road from Moncton, N. B., to Winnipeg, has arranged to commence surveys at once from Lake Abittibi to Moncton. No surveys will be made west of Quebec Province until it is determined whether the surveys already made by the Grand Trunk will be made use of. It will require 600 men to make up the surveying parties and as soon as this is arranged, the commission will give its attention to the section lying between Winnipeg and Lake Abittibi. There are on file between 1,500 and 2,000 applications for positions on the surveying staffs.

GREAT NORTHERN.—An officer writes that a contract has been let to A. Guthrie & Co., of St. Paul, for building an extension out of Mohall, N. Dak., in a northwesterly direction for a distance of 15 miles.

JACKSONVILLE & SOUTHWESTERN (ATLANTIC COAST LINE).—Press reports state that the Atlantic Coast Line is planning to extend this road from Newberry, Fla., to Fort Fannin, on the Suwanee river, 20 miles. Surveys for this extension have been practically completed. The new line will open up one of the finest timber lands in Florida and will give the Atlantic Coast Line a direct connection with deep water at Jacksonville and an outlet for all products along the Suwanee river.

KANSAS-OKLAHOMA INTERURBAN.—Surveys are reported completed for this proposed road to connect Arkansas City, Kansas; Chilocco, Okla. T.; Geuda Springs and Winfield, a total distance of 50 miles. W. C. Robinson is President. W. H. Somermeir, of Winfield, and A. J. Hunt, of Arkansas City, are interested.

LAWRENCEVILLE & WESTERN.—A charter has been granted this company in Virginia to build a railroad in Brunswick County. E. P. Buford, Lawrenceville, Va., is President, and Frank Buford, Secretary.

MEXICAN ROADS.—Plans have been completed for building an electric railroad 248 miles long from Guadalajara to Morelia. The Catholic Bank, of the City of Mexico, is behind the project.

The Mexican Government has granted an extension of one year to the Guaymas & San Marcial railroad for building a line 85 miles long between these points. The original concession was granted to the company in 1889 and expired on August 24 of this year. According to the new concession, the company must complete 10 miles of track within one year from that date. The remainder of the road must be completed within four years.

MORGANTOWN & KINGWOOD.—Surveys have been completed for the extension from Bretz, W. Va., north to Kingwood, 14 miles. It is stated that contracts for this section will be let very shortly. A further extension from Kingwood to Rowlesburg, 17 miles, will eventually be built, and surveys for this portion of the line are now in progress. F. K. Bretz, Morgantown, W. Va., is General Manager, and A. S. Brady is Chief Engineer. (September 16, p. 95.)

NATCHEZ, COLUMBIA & MOBILE.—An officer writes that work is in progress by the company's forces on an extension from Roonville, Miss., to the Pearl River, 7½ miles. Grading has been completed for a distance of two miles and one mile of track has been laid. The work is comparatively light, with a maximum grade of 80 ft. per mile and a maximum curvature of 6 degrees. R. B. Butterfield, Northfield, Mass., is General Manager. (September 9, p. 87.)

NEW MARTINSVILLE & MIDDLEBOURNE.—Incorporation has been granted this company to build a railroad from Steelton, W. Va., via New Martinsville and Middlebourne, along the Middle Island creek to the mouth of McElroy river, to its main fork, and thence by the most practicable route to the town of Salem, in Harrison County, 40 miles. The incorporators are: T. P. Jacobs, O. L. Haught and others, of New Martinsville. Rights of way will be secured at once.

NEW YORK CITY.—Arbuckle Bros. are reported to be back of a plan to build a terminal at the foot of Jay and Bridge streets, in Brooklyn. The Poillon estate, beginning at the east line of Bridge street and extending to the Kings County Gas & Electric Co.'s power house, is reported to have been acquired, with a stretch of water front 700 ft. along the river and 600 ft. deep. There will be a slip at the northeast corner of the property adjoining the electric power house which will receive the car floats. From this slip it is the intention to run a network of tracks aggregating several miles in all.

NORFOLK & WESTERN.—Track laying is reported about half completed on the Big Sandy extension from Kenova, W. Va., to Naugatuck, 59 miles. It is stated that the entire line will be open for traffic on November 20. C. S. Churchill, Roanoke, Va., is Chief Engineer. (See Construction Supplement.)

OKLAHOMA, TEXAS & GULF.—A charter has been filed by this company with a capital of $100,000 to build a road from Wright's Landing on the Red river in Red River County, Tex., passing through the town of Clarksville and traversing the counties of Red River, Bowie, Titus, Morris, Cass, Camp, Upshur, Marion, Harrison and Gregg, to a point north of Longview, a total distance of 100 miles. It is also proposed to build from Atoka, Ind. T., to a connection with the Texas division at the Red river, 90 miles. The general offices of the company will be located at Clarksville, Tex. The incorporators are: Alexander Richmond, of Muskogee, Ind. T.; J. W. O'Neil, G. J. Cheatham and others.

PORTLAND, MONTPELIER & HUNTINGTON.—Articles of incorporation have been filed by this company in Indiana with an authorized capital of $1,400,000. The proposed route of the road is not stated, but the headquarters of the company will be at Montpelier, Ind. W. F. Sinclair, D. R. Hardman, D. A. Williamson and others are incorporators.

RICHMOND, FREDERICKSBURG & POTOMAC.—This company has let a contract to Reiter, Curtis & Hill, of Philadelphia, for building its new freight yard at Alexandria, Va. The yard will cost about $1,000,000 and will accommodate all freight bound for southern points belonging to the six railroads which jointly own the R., F. & P. (August 5, p. 52.)

ROARING FORK.—A charter has been granted this company in Virginia to build a road from Norton, in Wise County, to the junction of Pot Camp on Roaring Fork of Powell river, connecting at Blackwood, Va., with the Louisville & Nashville. The road will reach valuable coal deposits in this section. Calvin Pardee, who is interested in the East Tennessee & Western North Carolina, is President of the company.

ROCHESTER, SYRACUSE & EASTERN (ELECTRIC).—According to press reports, work is in progress on three sections of this proposed road between Rochester, N. Y., and Syracuse. It is stated that the contracts for grading the fourth section will be let in a few days. The first 15 miles out of Rochester are being built by F. T. Ley, and the remainder of the work is being done by the Shields Construction Co. T. H. Mather, Syracuse, N. Y., is Chief Engineer. (August 26, p. 74.)

Statesboro & Northern.—Application has been made for a charter for this company to build a railroad from Statesboro, Ga., through Summitt and Swainsboro to Wrightsville. J. A. Bramet, Statesboro, Ga.; A. Herrington, Swainsboro; B. L. Rountree, Summitt, and others are incorporators.

Texas Central.—Surveys, it is reported, are now in progress for the proposed extension of this road from Stamford, Tex., northwest to Amarillo, 190 miles. It will connect with the Fort Worth & Denver City, the Rock Island and the Santa Fe at Amarillo.

Thomasville & Denton.—A contract is reported let to E. L. Probst & Co., of Charlotte, N. C., for building the first seven miles of this proposed road between Thomasville and Denton. Milton Jones, Thomasville, N. C., is President.

Union Pacific.—According to press reports, a contract has been let to Kilpatrick Bros. & Collins, of Beatrice, Neb., for grading an extension from Monoken, Kan., to Marysville, 85 miles. The contract calls for the completion of the line within six months.

Western Maryland.—This company has opened its Tidewater extension at Baltimore, running from Walbrook station along the western and southern border of the city to Port Covington, about six miles. The new line crosses under the Philadelphia, Baltimore & Washington and the main line of the B. & O. At Port Covington, elevated tracks and chutes for loading coal on ships have been built. These connect with the new freight pier, which is 820 ft. long and 120 ft. wide. With the completion of this line and the extension between Cumberland, Md., and Cherry Run, W. Va., the Wabash will have direct connection between Pittsburg and Tidewater at Baltimore.

West Virginia Interior.—A charter has been granted this company in West Virginia to build from Steelton through Middlebourne to Salem. T. P. Jacobs, New Martinsville, W. Va., is said to be interested.

RAILROAD CORPORATION NEWS.

Atchison, Topeka & Santa Fe.—At the annual meeting of the stockholders on October 27, the following propositions will be voted upon: To ratify leases of the Eastern Oklahoma, the California Eastern and the Southern California railroads; to confirm the purchase of the Eastern Oklahoma and the Montgomery County railroads, and to confirm the purchase of the capital stock of the Cane Belt R. R. The aggregate length of the Cane Belt is 104 miles.

Chicago, Indiana & Eastern.—Judge F. E. Baker, of Indianapolis, has appointed Superintendent G. W. Bartlett receiver of this road. The company controls a line between Muncie, Ind., and Converse, 43 miles. The receiver was appointed on the application of A. W. Howard, a creditor who holds an unpaid note for $12,500 due April 27, 1904.

Chicago, Rock Island & Pacific.—N. W. Harris & Co., of New York, are offering $1,000,000 general-mortgage 4 per cent. gold bonds secured by a lien on 3,128 miles of main line. These bonds are a part of the authorized issue of $100,000,000 general-mortgage 4s, of which $61,581,000 are outstanding and $12,500,000 are reserved to retire at maturity a like amount of 6 per cent. bonds.

Delaware, Lackawanna & Western.—See Hoboken & Manhattan.

Fort Worth & Rio Grande.—The Texas Railroad Commission has instituted preliminary proceedings to forfeit the charter of this company. It is alleged that in April, 1903, the company issued mortgage bonds to the amount of $994,000 and capital stock to the amount of $994,600 without authority from the Commission, and in direct violation of the State railroad laws. The case is set for hearing on October 18.

Hoboken & Manhattan.—The injunction suit brought by the Lackawanna in the Court of Chancery to restrain this company from building under the D. L. & W.'s land in Hoboken was dismissed by Vice-Chancellor Stevenson in Jersey City on September 21. The injunction was brought as the result of the decision handed down by Judge Dixon in August, appraising the value of right of way at only $10,300, as against $5,700,000 claimed by the railroad. For particulars, see our issue of August 19, page 66.

Louisiana Sugar Belt.—J. M. Dresser, of New Orleans, has been appointed receiver of this company, which was to build a road 70 miles long from Thibodeaux, La., to Grand Island. Only 13 miles of the line was completed.

Missouri, Kansas & Texas.—The report of this company for the fiscal year ending June 30, 1904, shows gross earnings of $17,766,595, an increase of $558,402. Operating expenses were $12,997,709, an increase of $548,626, leaving an increase in net of $9,775. The average mileage operated increased from 2,601 to 2,884, and there is a sharp decrease in gross and net earnings per mile. Freight earnings decreased $153,991, owing largely to losses caused by the Trunk line export-grain war. Passenger earnings, however, increased $641,747. The company is considering a plan to provide capital for future extensions which may be made, and a refunding first mortgage of $40,000,000 may be made. After deducting all fixed charges, the surplus for the year was $1,066,368, a decrease of $33,547 over 1903.

New York & Canada.—The stockholders of this company have voted to increase the capital stock from $4,000,000 to $9,000,000 for the purpose of reimbursing the Delaware & Hudson Co. for the New York & Canada bonds, which the controlling company paid off last spring. The new issue is to be of 5 per cent. non-cumulative preferred stock.

St. Louis, Brownsville & Mexico.—The stockholders will vote, November 15, on the following propositions: To authorize the letting of a contract for a branch line from Robstown, Tex., to Sinton and Bay City, 142 miles, and to authorize a first mortgage of $4,000,000 to secure 5 per cent. gold bonds to be issued at a rate not exceeding $7,800 per mile upon the company's line from Robstown to Brownsville, and also on the Hidalgo branch. The road is now in operation between Brownsville, Tex., and Robstown, 140 miles, and work is in progress on the branch to Hidalgo.

Southern.—This company has filed an equipment mortgage with the Providence Life & Trust Co., of Philadelphia, for $2,995,000, to be used for the purchase of rolling stock and equipment. It is stated that the money secured by this loan will be invested in 120 locomotives, 1,000 steel hopper coal cars and 1,500 box cars.

Vera Cruz & Pacific.—The receiver of the Maryland Trust Co. has sold to Speyer & Co. at 88½ the issue of $6,000,000 4½ per cent. bonds, guaranteed by the Mexican Government. This sale is subject to the approval of the court. The total mortgage is for $7,000,000.

Wabash.—The Wabash-Pittsburg Terminal Co., the entire capital stock of which is owned by the Wabash, has bought the majority of the $14,000,000 capital stock of the Pittsburg Terminal Railroad & Coal Co. The terms of the purchase have not been made public, but the price paid is reported to be $21.50 per $100 share. The Pittsburg Terminal Railroad & Coal Co. is a line from Pittsburg to Clairton, Pa., 21 miles, with a branch to Banksville, two miles, and 13 miles of sidings. It connects with all the railroads entering Pittsburg and owns large coal lands in Allegheny County. The company recently issued $7,000,000 5 per cent. bonds, of which a part has already been sold.

RAILROAD GAZETTE

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CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

FRIDAY, SEPTEMBER 23, 1904.

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